OL. XXXV. PART 5

MAY, 1956

(*Issued June, 1956*)

THE REVIEW

OF

APPLIED MYCOLOGY

Compiled from

WORLD LITERATURE ON PLANT PATHOLOGY
AND APPLIED MYCOLOGY

THE COMMONWEALTH MYCOLOGICAL INSTITUTE
KEW, SURREY

Price 6s. net

PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, OXFORD, BY CHARLES BATEY, PRINTER TO THE UNIVERSITY

COMMONWEALTH MYCOLOGICAL INSTITUTE

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POSNETTE (A. F.) & CROPLEY (R.). **Leaf roll : a virus disease of Cherry.**—*Rep. E. Malling Res. Sta., 1954*, pp. 126–127, 1 pl., 1955.

Kent cherry orchards are affected by a graft-transmitted virus termed leaf roll which differs from all those already described. Mature trees of some varieties die within a few years of infection, circumstantial evidence suggesting spread from tree to tree. The most typical symptom is the upward rolling of the leaves, which appear to be semi-wilted, but are stiff, and rattle when shaken. The leaves of Early Rivers, as distinct from other varieties, turn dull purplish-red in summer. The flower pedicels of infected F12/1 are less than half the normal length. Severely affected trees exude gum profusely through longitudinal fissures in the bark of the trunk and main branches. Growth is checked, the few new shoots that develop subsequently being rosetted.

Leaf roll differs from buckskin disease [*R.A.M.*, 31, p. 69] in having a severe effect on trees on Mazzard rather than on Mahaleb stocks, and in not developing an orange discoloration along the midrib, while the absence of leaf mottling distinguishes it from other necrotic diseases such as Lambert mottle [25, p. 218] and necrotic rusty mottle [33, p. 611]. In orchards the symptoms resemble those of *Armillaria mellea* and bacterial canker (*Pseudomonas mors-prunorum*), particularly if bacterial infection has occurred on the trunk or in the fork of the main branches.

DELMAS (H. G.). **Le dépérissement des Cerisiers de l'arrondissement de Céret.** [The decline of the Cherry-trees in the district of Céret.]—*Progr. agric. vitic.*, 143, 23–24, pp. 345–350, 1955.

Investigations conducted from 1950 until 1954 into a frequently fatal decline of cherry trees commonly present in the region of Céret, eastern Pyrenees, France [cf. *R.A.M.*, 32, p. 323], showed that the condition is due to infestation by *Capnodis tenebrionis*, root rot (*Armillariella* [*Armillaria*] *mellea*) [cf. 16, p. 821; 31, p. 69], zinc deficiency [cf. 32, p. 259; 34, p. 303], or a combination of all three.

The zinc deficiency may be remedied by two or three sprays annually with 3 per cent. zinc sulphate at fortnightly intervals from the time the buds open until flowering. Zinc injection into the trunk sometimes caused burning and gummosis, while soil applications were mostly ineffective. [This information also appears in *C.R. Acad. Agric. Fr.*, 41, 7, pp. 333–337, 1955.]

BRASE (K. D.) & PARKER (K. G.). **Decline of Stanley Prune trees.**—*Plant Dis. Reptr*, 39, 5, pp. 358–362, 4 figs., 1955. [Multilithed.]

In New York, Stanley prune trees grown on Myrobalan rootstocks (*Prunus cerasifera*) with a chlorotic leaf fleck [*R.A.M.*, 24, p. 235] developed a constriction at the bud union, the roots were weakened, and some affected trees died. Other varieties budded on the same stocks showed only reduced growth. It is suggested that Stanley may sometimes contain a factor that is lethal to rootstocks affected by chlorotic fleck but does not seriously affect normal stock.

Maksimov (L. P.). Простой способ борьбы со Сферотекой Крыжовника. [A simple means of controlling *Sphaerotheca* on Gooseberry.]—Сад и Огород [*Orchard & Garden*], *1955*, 6, p. 68, 1955.

Satisfactory control of gooseberry powdery mildew (*Sphaerotheca* [*mors-uvae*: *R.A.M.*, 33, p. 163]) was obtained in the U.S.S.R. by thoroughly spraying the leaves and twigs at the time of the appearance of the disease with common lye, made by mixing a quarter watering can of ordinary ash with a canful of boiling water and adding 30 to 40 gm. household soap as a sticker. A single application was usually quite efficient, but it could be repeated if a second attack of the disease occurs.

Frick (E. L.). **Laboratory tests of the effects of fungicides on the spore-germination of Botrytis cinerea Pers. ex Fr.**—*Rep. E. Malling Res. Sta.*, *1954*, pp. 149–151, 1955.

Laboratory experiments were conducted at East Malling Research Station to determine the fungicides most effective in inhibiting spore germination of *Botrytis cinerea* with a view to controlling this disease on strawberries [see following abstracts]. The most active were 8-hydroxyquinoline and its potassium salt, phenylmercuric chloride, a phenylmercuric 8-hydroxyquinoline complex, certain nitropyrazoles, captan, and thiram, of which the last two would be the most suitable in the field. Tecnazene and pentachloronitrobenzene, though already in use against *B. cinerea* [*R.A.M.*, 32, p. 534], did not inhibit spore germination. Thiram, ferbam, ziram, and manganese dimethyldithiocarbamate were inhibitory at both 0·01 and 0·0001 per cent. but complete germination occurred at 0·001 per cent. [cf. 22, p. 364].

Moore (M. H.) & Tew (R. P.). **Greenhouse testing of fungicides against Botrytis rot (grey mould) of Strawberry and other soft fruits.**—*J. hort. Sci.*, 30, 4, pp. 213–219, 1955.

A greenhouse test for fungicides to control *Botrytis cinerea* rot of strawberries and other ripening soft fruits was devised at East Malling Research Station, Kent [cf. *R.A.M.*, 33, pp. 541, 737, and preceding and following abstracts].

With chemicals to be tested as aqueous dispersions, field samples of fruit were dipped by their stalks in appropriate solutions, being immersed over the calyx and withdrawn rapidly five times. Fruits to be dusted were pre-treated in a 0·01 per cent. aqueous wetter solution and air-dried, to ensure adequate spread of the spore suspension. Subsequent inoculation by inserting a small piece of strawberry fruit rotted by *B. cinerea* under the calyx proved too drastic, and instead a spore suspension of the fungus, produced by swirling infected fruit in distilled water, plus a wetter to disperse spore aggregates, was sprayed on to the surface-dried fruit in a moist chamber.

In preliminary experiments with several chemicals copper sprays showed little merit and sulphur dust, though superior to 'liquid' sulphurs, did not justify further investigation. The most promising materials were 0·4 per cent. salicylanilide, and 0·2 per cent. thiram and captan. In the final experiments thiram proved the best, as a 0·5 per cent. aqueous dispersion; the dispersions, especially as disinfectants, were superior to 10 per cent. dusts.

Kirby (A. H. M.), Moore (M. H.), & Wilson (Dorothy J.). **Strawberry Botrytis rot (grey mould) control: a field trial of captan at East Malling.**—*J. hort. Sci.*, 30, 4, pp. 220–224, 1955.

Trials for the control of *Botrytis cinerea* rot of strawberry [see preceding and next abstracts] were carried out in 1953 and 1954 by spraying irrigated and non-irrigated plots of the variety Royal Sovereign at East Malling Research Station, Kent, with captan used as a 50 per cent. wettable powder. Two post-blossom sprays (2 lb. per 100 gals. and averaging over 700 gals. per acre, considerably more

than would probably be needed in commercial practice), applied by lance both to strawed alleys and plants, significantly reduced the percentage of rotted fruit and increased the marketable crop by about 30 per cent., especially on irrigated plots. Hose irrigation increased rot losses on control plots, but gave higher yields on sprayed plots.

MARSH (R. W.), MARTIN (J. T.), & CRANG (ALICE). **The control of Botrytis rot (grey mould) of Strawberries, and the effects of fungicide spray residues on the processed fruit.**—*J. hort Sci.*, 30, 4, pp. 225–233, 1 graph, 1955.

In a preliminary field trial at East Malling Research Station, Kent, on Auchincruive Climax strawberries, *Botrytis cinerea* rot [see preceding abstracts] was reduced to approximately one-third of that on unsprayed control plots by three sprays between blossom and harvest of 0·25 per cent. captan or 0·4 per cent. thiram; 0·125 per cent. captan was less effective, and 0·2 per cent. tecnazene and salicylanilide sprays gave no control.

The maximum captan residue on ripe strawberries was 19 p.p.m., which did not affect the flavour or ascorbic-acid content; canned thiram-sprayed strawberries developed marked tainting, caused apparently by a decomposition product of the fungicide, and captan-sprayed ones less. No deleterious effect from any spray was observed in jams.

DARROW (G. M.). **Leaf variegation in Strawberry—a review.**—*Plant Dis. Reptr*, 39, 5, pp. 363–370, 2 figs., 1955. [Multilithed.]

The author gives a historical survey, with frequent references to the literature (37 titles), of the June yellows disease of strawberries [*R.A.M.*, 34, pp. 604, 733] in the United States.

MCKEEN (W. E.) & BOSHER (J. E.). **Verticillium wilt of Strawberries in British Columbia.**—*Plant Dis. Reptr*, 39, 5, pp. 371–372, 1 fig., 1955. [Multilithed.]

A *Verticillium* sp. is reported to be responsible for wilting of strawberry plants during the fruiting period on the Saanich Peninsula of Vancouver Island and in the Fraser Valley, British Columbia, Canada [cf. *R.A.M.*, 35, p. 159]. The outer leaves of the affected plants appear dark green and water-soaked, while small, reddish-brown lesions, later coalescing into extended, depressed, charcoal-black areas, are observed on the petioles. The leaves wilt and the necrosis spreads throughout the laminae. The disease, which is widespread and of major importance in many fields, is believed to have been present in British Columbia for several years. Soil treatment with dow MC-2 gave effective control.

RAABE (R. D.) & ZENTMYER (G. A.). **Avocados and Dematophora root rot.**—*Calif. Citrogr.*, 40, 12, p. 475, 1955.

Rosellinia necatrix has been reported in 15 counties in California [cf. *R.A.M.*, 33, p. 490], including San Bernardino, Orange, and Riverside. In greenhouse tests the Mexican avocado rootstock varieties Topa Topa and Mexicola, and the Guatemalan Anaheim and Dickinson were found to be susceptible to the pathogen [cf. 26, p. 146], which caused wilt within three weeks of soil inoculation and death within five, producing small white plaques in the bark and cortex of infected roots. New avocado orchards should not be planted on infested soil.

CHIDDARWAR (P. P.). **A powdery mildew on Carica papaya L.**—*Curr. Sci.*, 24, 7, pp. 239–240, 1 fig., 1955.

A powdery mildew causing severe damage to young papaw seedlings was recently observed in Poona, India. Adult plants were not affected. Small, circular spots appeared on both sides, particularly the upper, of young leaves, which became turgid and broke off. In the advanced stages the growing shoots developed severe die-back and were ultimately killed. The pathogen, designated *Oidium indicum*

n.sp., differs from *O. caricae* [*R.A.M.*, 33, p. 436] in that its spores are barrel-shaped instead of elliptical and measure 31 to 46 by 13·7 to 23·4 μ.

STOVER (R. H.). **Flood-fallowing for eradication of Fusarium oxysporum f. cubense : III. Effect of oxygen on fungus survival.**—*Soil Sci.*, 80, 5, pp. 397–412, 1 fig., 1 diag., 1 graph, 1955.

In soil 25 per cent. saturated with water at the United Fruit Company, Division of Tropical Research, La Lima, Honduras, *Fusarium oxysporum* f. *cubense*, the agent of banana wilt [*R.A.M.*, 33, p. 505; 34, p. 467], survived for 152 to 180 days in an anaerobic jar as compared with 81 days under comparable conditions in saturated soil. Returned to an aerobic environment, the pathogen multiplied in the soil, the process being more rapid in a sterile than in a non-sterile medium, in loam than in sandy loam, and in dry (15 to 25 per cent. saturated) than in moist (35 to 85 per cent. saturated) soil. In general, survival and multiplication were low in soil from the upper and high in that from the lower half of the container. The organism failed to survive for 45 days in tap water under anaerobic conditions.

In submerged soils *F.o.* f. *cubense* and other fungi, especially *Trichoderma*, *Aspergillus*, and *Penicillium* spp., persisted for at least six to 12 months in the surface inch of soil but not at lower depths. Usually there was no consistent difference between the number surviving in loam and sandy loam or in sterile and non-sterile soils.

In laboratory experiments the addition to the water of peptone at the rate of 2 gm. or 1 gm. plus 0·25 gm. weekly per gm. soil reduced the surviving population of *F.o.* f. *cubense* in submerged soil, as also did a $\frac{1}{2}$-in. layer of mineral oil on the surface of the water. Certain cultures of water plants, e.g., *Utricularia*, greatly increased the survival rate in the water and on the soil surface, whereas a predominance of filamentous algae reduced it in submerged soil and caused fluctuations in the numbers persisting in water.

It is concluded from these observations that the survival of the pathogen in submerged soil is determined by the amount of oxygen available to the surface-oxidized soil layer. Hence factors increasing or reducing the oxygen supply in the water produce similar trends in the persistence of *F.o.* f. *cubense* in the water and on the submerged soil surface.

MOORE (M. H.). **The search for better fungicides.**—*Rep. E. Malling Res. Sta., 1954*, pp. 152–154, 1955. [Reprinted from *Grower, 1954*, Annual Fruit Review, pp. 45–47, 1954.]

The author briefly reviews for the benefit of fruit-growers the results of current research on new fungicides and methods of application, against the background of the traditional Bordeaux mixture and sulphur compounds.

TESCHNER (GERTRUD). **Einfache Laboratoriumsteste als Beitrag zur fungiziden Mittelprüfung.** [Simple laboratory tests as a contribution to the examination of fungicides.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 7, 10, pp. 170–175, 8 figs., 1955.

The article describes two new, simple, and rapid tests for fungicides, partly adapted from Schmidt's method [*R.A.M.*, 31, p. 502]. For tests against *Plasmopara viticola* a constant supply of 'seedlings' of the highly susceptible vine varieties Müller-Thurgau and Riesling is maintained throughout the year in the greenhouse. When the second leaf appears (about five weeks after planting) the lower roots are removed and four seedlings placed into a bottle of water, three bottles under one bell-jar. The leaves are sprayed on the lower surface with fungicide and next day inoculated with a spore suspension. The bell-jar is kept closed for one day and then tilted open. On the fourth day the filter-papers on which the bottles are standing are moistened and the jar is closed. The incubation period is usually five days; the test is terminated after nine. The room temperature should not exceed

22° C. and additional light may be needed in winter. Any rot caused by bruising should be removed. For similar experiments with *Oidium tuckeri* [*Uncinula necator*], 'seedlings' can be used after six weeks, when the second leaf is half as large as the first, and the leaves are sprayed only on the upper side. They are inoculated by shaking a diseased plant over the seedling. Less light is needed than for *P. viticola*. Grey spots show on the youngest leaves five days after inoculation, changing to white by the twelfth day, when the test is ended. Alternation of high and low temperature favours the growth of the fungus.

In the second method glass slides, 3·8 by 2·6 cm., covered with a film of malt agar, are inoculated with *Coniophora cerebella* [*C. puteana*], *Botrytis cinerea*, or *Rhizoctonia* [*Corticium*] *solani* and after two to three days are placed in Petri dishes on filter-papers previously soaked in malt extract and sprayed with 3 ml. of fungicide. Growth over the filter-paper is compared with that over the controls sprayed with water. The test is completed in six days.

Schnicker (J. L.). **Kemikaliekontrollen i finansåret 1954–55.** [Inspection of chemicals in the financial year 1954–55.]—*Tidsskr. Planteavl*, 59, 4, pp. 692–716, 1955.

Of the 976 samples of chemicals analysed during 1954–5 for possible infringements of the Danish plant-protective and poison laws [cf. *R.A.M.*, 34, p. 468], 98 were submitted by the State Phytopathological Service. One Bordeaux powder contained 20, and another 30 per cent. less monohydrated copper sulphate than declared. The contents of different lots of zineb-containing preparations ranged from 40 to 50 instead of 65 or 70 per cent., while one with ferbam as its active ingredient was 20 per cent. below standard.

Frank (H.). **Vergleichende Untersuchungen über den Wirkungsmechanismus des Phenylquecksilberborates und des Quecksilber (II) chlorides auf niedere Pilze.** [Comparative studies on the mechanism of action of phenyl mercury borate and mercury (II) chlorides on lower fungi.]—*Zbl. Bakt.*, Abt. 2, 108, 23–25, pp. 660–671, 12 graphs, 1955.

In comparative experiments at the Botanical Institute, University of Munich, Germany, merfen (phenyl mercury borate) at the optimum concentration of 5×10^{-7} to 5×10^{-8} M. exerted a much stronger inhibitory action on malt extract-peptone-yeast extract cultures of *Actinomucor repens* and *Absidia tuneta* n. sp. (unpublished) [? nom. nud.], isolated by Dr. Muskat at the above-mentioned Institute from Tunisian soil samples, and on two dermatophytes, *Trichophyton gypseum* and *Cephalosporium acremonium*, procured from the University Skin Clinic, than did a mixture of phenol, mercuric chloride, and boric acid or any of these constituents alone. It is postulated that mercuric chloride acts primarily by blocking the action of the parenchyma cell constituents which catalyse protein synthesis, whereas merfen generally produces a comparable effect on a large number of cellular enzymes.

Prat (J.). **Granulométrie des poudres cupriques.** [Granulometry of copper powders.] —*Phytiatrie-Phytopharm.*, 4, 2, pp. 95–113, 8 graphs, 1955.

In trials organized by the Commission for Physical and Chemical Methods of Pesticide Analysis in France in 1953 an attempt was made to apply the granulometric method elaborated for micronized sulphur by Avy and Raillère (*Mémor. Serv. Chim. État* 37, p. 135, 1952) to determine particle size in copper powders. The method is based on sedimentation rates. A suspension is prepared in a dispersal medium containing sucrose, gum arabic, and phenol. By decanting from beaker to beaker, each time allowing a longer sedimentation period, four fractions are separated, the particle dimensions of which can be obtained from tables of sedimentation time and density. The sediments are dried and weighed, the weight of the fraction comprising the smallest particles, which is still mixed with the

dispersal medium, being calculated by subtraction from the original weight of the powder. Eight copper products incorporating copper oxychloride, copper oxide, basic copper sulphate, and basic copper carbonates were tested by the Central Laboratory of the State Chemical Services, the Société Péchiney-Progil, the Société Solvay, and the United Sulphur Refineries. Despite certain difficulties, such as the presence of oil and various adjuvants, it is concluded that the method is suitable for the purpose. Some comparative tests were made of other granulometric methods.

Burchfield (H. P.) & Schechtman (Joan). **Method for measuring the crystallization rate of Bordeaux mixture.**—*Contr. Boyce Thompson Inst.*, 18, 4, pp. 215–223, 3 graphs, 1955.

A method is described for measuring the deterioration of Bordeaux mixture [*R.A.M.*, 17, p. 334] through crystal growth, based on the rate of solubilization of copper in sucrose solutions. The fungicide dissolved rapidly (in four minutes) when freshly prepared, but only slowly when aged, owing to the decreased specific surface of the crystalloid. Soluble copper was determined optically at 650 mμ. Deterioration followed a skewed sigmoid curve with an initial induction period probably corresponding to the time required for nuclei to form. The induction period for 10–10–100 Bordeaux prepared from analytical grade chemicals was 23 minutes at 45° C.

Culver (A. J.). **A self-propelled small-plot sprayer.**—*Plant Dis. Reptr*, 39, 5, pp. 433–436, 3 figs., 1955. [Multilithed.]

A self-propelled, self-powered sprayer was developed at the Plant Pest Control Branch, Agricultural Research Service, United States Department of Agriculture, Corvallis, Oregon, for small-plot experimental testing of fungicides and herbicides. The sprayer rests on three wheels, drive being through the rear wheels, and can be steered with one hand only. It can climb a 30° grass slope with the operator riding and will pull through soft mud. The turning radius is 5 ft. and the speed up to 6 m.p.h. The spray pump has a capacity of 3 gals. per minute at 250 lb.per sq. in., and the tank consists of two 5-gal. compartments with a v-bottom for dry pumping.

Sijpesteyn (A. K.) & Van Der Kerk (G. J. M.). **Investigation on organic fungicides. VIII. The biochemical mode of action of bisdithiocarbamates. IX. The antagonistic action of certain imidazole derivatives and of α-keto acids on the fungitoxicity of dimethyldithiocarbamates, and di-isothiocyanates.**—*Biochim. biophys. Acta*, 13, pp. 545–552, 4 graphs, 1954; 15, pp. 69–77, 3 figs., 1954. French and German summaries.]

In further studies in the current series [*R.A.M.*, 34, p. 47] at the Institute for Organic Chemistry, Utrecht, Holland, the inhibitory action of tetramethylene di-isocyanate and nabam on spore germination in *Penicillium italicum* and *Aspergillus niger* [34, p. 469] was found to be powerfully counteracted by thioglycocollic acid and cysteine, presumably through the operation of a chemical reaction between the fungicides and the sulphydryl compound. Strong support was lent to this hypothesis by the observation that the pre-formed reaction products of either of the fungicides with thioglycocollic acid are virtually non-toxic.

The observed reactivity of thiol compounds towards tetramethylene diisocyanate and nabam indicates that the antifungal action of these substances is due to their combination with all constituents carrying essential sulphydryl groups. In conclusion, the mechanism of the antifungal action of the bisdithiocarbamates and related substances is discussed at some length.

Using the same two species, with occasional resort to *Botrytis allii* and *Rhizopus nigricans* [*R. stolonifer*], L- and D-histidine, L-histidinol, and imidazole-4-carboxylic acid were found to antagonize the inhibitory action of sodium dimethyl dithiocarbamate (NaDDC) on spore germination, imidazole-4-pyruvic acid being approxi-

mately ten times more effective than histidine and the other compounds less. That the antagonistic activity of imidazole derivatives was not due to their conversion to L-histidine was demonstrated by the use of a histidine-deficient mutant of *A. niger*. It was also found that for *A. niger* α-keto acids were very active antagonists of NaDDC in the first inhibition zone of the plate cultures, but they were totally ineffective in the case of the three other fungi. It is suggested that the imidazole derivatives prevent NaDDC from interacting with some essential enzyme system.

Parker-Rhodes (A. F.). **Statistical aspects of fungus forays.**—*Trans. Brit. mycol. Soc.*, 38, 3, pp. 283–290, 1955.

From a statistical investigation of the reliability of employing fungus forays as a basis for compiling floras of the higher fungi it is concluded that these provide as good a method as can be expected, but would be more satisfactory if they were on a smaller scale and of more frequent occurrence than is usual.

Driver (C. H.) & Wheeler (H. E.). **A sexual hormone in Glomerella.**—*Mycologia*, 47, 3, pp. 311–316, 1955.

Further studies at the Department of Botany, Bacteriology, and Plant Pathology, Louisiana State University, demonstrated the production by self-fertile, clumped-perithecial, wild-type cultures of *Glomerella cingulata* [*R.A.M.*, 34, p. 165] of a sexual hormone which induced selfing in a nearly self-sterile, scattered-perithecial mutant. Cultures of the mutant, differing from the wild-type in a single gene pair, produced numerous mature perithecia, self-sterility resulting from nuclear disintegrations occurring either shortly before or during karyogamy. Since the hormone causing selfing was produced only by cultures actively undergoing karyogamy, and was effective only when applied to cultures before they reached this stage, it appears to be a specific substance required for karyogamy.

Tsitsin (N. V.). **My researches in distant hybridization.**—*Sci. & Cult.*, 21, 3, pp. 139–148, 4 pl., 1955.

A wheat hybrid No. 599, developed at the U.S.S.R. Academy of Sciences, Moscow, from a cross between the rye-wheat hybrid 46/131 and blue couch grass (*Agropyron* sp.) is reported to be immune from stinking smut [bunt: *Tilletia* sp.]. The variety was first introduced for cultivation in 1948 and now covers 100,000 ha. The perennial wheat No. 2 is stated to be resistant to smut [*Ustilago tritici*: *R.A.M.*, 33, p. 717] and bunt and is recommended for use in tests on both an experimental and a market scale.

Schrödter (H.). **Die Bedeutung von Maßenaustausch und Wind für die Verbreitung von Pflanzenkrankheiten. Ein Beitrag zur Epidemiologie.** [The importance of mass exchange and wind in the spread of plant diseases. A contribution to epidemiology.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 8, pp. 166–172, 1954. [Abs. in *Z.PflKrankh.*, 62, 11, p. 728, 1955.]

The dissemination of plant-pathogenic spores in relation to mass exchange and wind as a basis of epidemiology was studied [? at the Aschersleben branch of the German Biological Institute: cf. *R.A.M.*, 32, pp. 263, 462]. Both height and duration of spore flight are independent of wind, which only influences distance. The two values are determined in the first instance by the rate of sinking as a property of the transported particle and by mass exchange as an expression of the turbulence of the air.

By means of the equations calculated by Rombakis for various exchange coefficients (0·5 to 50 gm. per cm. second) the height and duration of the flights of different-sized spores (4 by 1 to 70 by 40 μ) were computed, together with the distances covered at wind velocities between two and ten m. per second. The resultant data showed that the most minute spores would be able to traverse distances of 1,000,000 km. at a height of over 6,000 m. and for a duration of 13½ years when winds

of moderate turbulence and low velocity prevail. Large spores, too, can cover distances of several hundred kilometres under the influence of high wind speeds with a considerable degree of turbulence. For instance, in fine, still weather the sporangia of *Phytophthora infestans* may be disseminated over about 100 m. in less than one minute, while under the rainy and windy conditions conducive to an epiphytotic [of potato blight] they may be carried for distances exceeding 100 km. in a few hours.

McClung (N. M.). **A method for testing paraffin utilization by microorganisms.**—*Mycologia*, 47, 3, pp. 424–427, 6 figs., 1955.

A method for testing paraffin utilization, which can be used as a criterion for speciation in certain micro-organisms, particularly actinomycetes, was devised at the Department of Botany, University of Kansas, Lawrence. The bottom of sterile Petri dishes is thinly coated with sterile, melted paraffin wax (tissuemat, Fisher Scientific Co., melting point 56° to 58·5° C.) and 10 ml. of an agar medium containing mineral salts at 50° is poured over the paraffin. A thin layer of paraffin covers the medium, which forms an island in the bottom of the dish. The medium is inoculated at the edge or at points on the surface. After incubation for three weeks at 28° in a saturated atmosphere, growth is compared with that on control plates without paraffin.

Brod (G.). **Studien über Cercospora mercurialis Passer. in Hinblick auf eine biologische Bekämpfung des Schutt-Bingelkrautes (Mercurialis annua L.).** [Studies on *Cercospora mercurialis* Passer. with a view to biological control of Annual Mercury (*Mercurialis annua* L.) growing on refuse dumps.]—*Phytopath. Z.*, 24, 4, pp. 431–442, 2 figs., 1955.

In 1951 and 1952 *Mercurialis annua* in the Mannheim-Heidelberg region of Germany was severely attacked by *Cercospora mercurialis* [*R.A.M.*, 35, p. 61], with a resultant heavy fall in seed production, and the possibility of utilizing the fungus to eradicate the weed was therefore investigated at the Hohenheim Plant Protection Institute. The principal characteristics of the fungus *in vitro* are given.

Infection is readily transmissible to healthy plants by means of conidia or mycelium, the duration of the incubation period (12 to 18 days) being directly proportional to the prevailing temperature. Direct control by the fungus, however, would seem to be precluded by (*a*) the extreme vitality of the host and (*b*) the long incubation period, the infected leaves only dying off when the plants had already produced two to three times their original mass of foliage. Thus, it would be impossible to destroy or even perceptibly to weaken the weed by this method.

Dulaney (E. L.), Larsen (A. H.), & Stapley (E. O.). **A note on the isolation of microorganisms from natural sources.**—*Mycologia*, 47, 3, pp. 420–422, 1 fig., 1955.

To eliminate undesired organisms from platings of soil and other natural materials for the isolation of *Streptomyces* cultures the authors, working at the Research Laboratories, Merck & Co., Inc., Rahway, New Jersey, used the following combination of antibiotics: actidione, polymyxin, and subtilin, each at 20 units per ml. agar, and penicillin (2·5). Excellent results in the elimination of both actinomycetes and bacteria during the isolation of fungi were given by a mixture of penicillin 5 units per ml., streptomycin (10), aureomycin (20), polymyxin 40γ per ml., and bacitracin (20γ). The problem of rapidly spreading fungi was partly solved by adding sodium desoxycholate to the agar medium before sterilization at a final concentration of 0·03 per cent. Fungi grow and sporulate but radial growth is markedly inhibited. A wide range of fungi was isolated by this method.

Leach (C. M.). **A simple device for single spore isolation.**—*Phytopathology*, 45, 7, pp. 405–406, 2 figs., 2 diags., 1955.

A cylindrical cutter of the biscuit cutter type for removing pieces of agar bearing

single spores [cf. *R.A.M.*, 18, p. 404] is described from the Oregon Agricultural Experiment Station. The cutter is at the end of a bent metal arm, projecting downwards from a collar fitting round the microscope objective, in such a way that the cutter is in the field of view of the 16 mm. objective. The spore is brought into the centre of the cutter and the microscope racked down to effect the cut; the cutter can be removed for flaming without altering the objective.

Rieth (A.). **Rhizomknollen von 'Helianthus tuberosus' ein gutes Nährsubstrat zur Pilzkultur besonders für 'Claviceps purpurea'.** [Rhizome tubers of *Helianthus tuberosus* a good nutrient medium for fungus culture, especially for *Claviceps purpurea*.]—*Pharmazie*, 10, 3, pp. 206–208, 2 figs., 1 diag., 1955.

At the Institute for Research on Cultivated Plants, Gatersleben, near Aschersleben, Germany, the author has obtained excellent results in the culture of *Claviceps purpurea* [cf. *R.A.M.*, 34, p. 225] on a medium consisting of an emulsion or expressed sap of Jerusalem artichoke (*Helianthus tuberosus*), diluted 1 in 3 with twice-distilled water, and 2 per cent. agar. After 16 days at 24° C. the mycelium covered an area of 39·4 sq. cm., as compared with 21·5 and 16·2 sq. cm. on peptone glucose agar and yeast glucose agar, respectively. Full directions are given for the preparation of the medium.

C. purpurea also thrives on fragments of coco-nut endosperm in water and in dilute coco-nut milk, the latter giving rise to a profuse submerged mycelium.

Payak (A. A.). **A modified Petri dish method for rust infection of excised leaves.** – *Experientia*, 11, 6, pp. 239–241, 2 figs., 1955. [German summary.]

At the Botany Laboratory of the Maharashtra Association for the Cultivation of Science, Poona, India, the writer has used a modification of Craigie's method for the study of sex behaviour in rusts [*R.A.M.*, 11, p. 262], involving the culture of detached leaves in Petri dishes [25, p. 269 *et passim*]. The infected and watersoaked material is stuck at both ends to the inside of the lid of the dish by means, e.g., of melted paraffin, with the teleutosori facing downwards. In the other half of the dish the washed healthy leaves are supported, for instance, by rubber bands, built-in notches [4, p. 375], or paraffin-coated circular disks of wire screen with bent edges [7, p. 531]. The healthy leaves are sprayed with an atomizer and the bottom of the dish just covered with distilled water. The infected material is then placed in position over the lower half of the dish. A sporidial shower occurs after six to eight hours, during which period the lids can be rotated to obtain scattered pustules on different regions of the leaves. After 48 hours the inoculum is removed and the lids thoroughly cleaned before replacing on the dishes, which are kept near a window in diffused light. The water should be changed at least every other day and the inoculated leaves sprayed with water at intervals. In very young leaves, e.g., of *Justicia gendarussa* infected by *Puccinia thwaitesii*, pustules appear after six days, but on older ones with a thick cuticle a period of 12 to 15 days is required for their development. The formation of callus at the petioles results in rooting of the leaves, which lasted for up to 60 days, while the rust pustules could be maintained for about six weeks.

The pustules of *P. thwaitesii* produced by this method were barely perceptible (2 to 4 mm. in diameter as compared with 5 to 20 mm. in nature), but the homothallism of the rust was demonstrated by the fact that single pustules produced teleutosori.

Advantages of the Petri dish technique include convenience in manipulation and observation, the small amount of material required, and increased accuracy in counting, measuring, and classifying the pustules as simple, compound, mono-, bi-, or multisporidial. Its drawbacks are that the leaves do not invariably survive

long enough for the completion of observations on infection, and that the natural environment for optimum development of a given rust is not fully simulated.

Doguet (G.). **Recherches sur la conservation des souches de champignons en culture sur milieu nutritif gélosé.** [Studies on the preservation of fungus strains in culture on nutrient agar media.]—*Bull. Soc. mycol. Fr.*, 71, 2, pp. 135–146, 1955.

Following an investigation at the Botanical Institute, Caen, extending over four years, of the reliability of preserving about 100 miscellaneous fungus cultures on nutrient media in cotton-stoppered test-tubes the author concludes that in general at room temperature most may be kept safely without subculturing for from 15 months to four years. The addition of *Cytisus* leaves or stems to media gave abundant and rapid formation of perithecia.

Jahnel (H.). **Physiologisches über Einwirkung von Schwefeldioxyd auf die Pflanzen.** [Physiological data concerning the effect of sulphur dioxide on plants.]—*Wiss. Z. tech. Hochsch. Dresden*, 4 (*1954–55*), 3, pp. 447–451, 1955.

This is an intensive study of the effects of sulphur dioxide on plant physiology, with special reference to forest trees in Germany [cf. preceding abstract].

Lüthi (H.) & Vetsch (U.). **Über das Vorkommen thermoresistenter Pilze in der Süßmosterei.** [On the occurrence of thermoresistant fungi in the sweet must industry.]—*Schweiz. Z. Obst- u. Weinb.*, 64, 21, pp. 404–409, 3 figs., 1 graph, 1955.

Experiments on the contamination of sweet must [cf. *R.A.M.*, 32, p. 268] by *Byssochlamys nivea* (snow mould) showed that prevention depends less on pasteurization than on the rigorous prevention of even the smallest infiltration of oxygen, especially through rubber parts which have become porous. Frequently mouldiness of must in corked bottles is due to the porosity of the cork rather than to inadequate disinfection; bottles should be filled to capacity and closed by metal capsules.

Besides this and previously described moulds [loc. cit.] a new thermophylic fungus was found recently in Switzerland and determined as *Phialophora mustea* at the Institut voor Schimmelcultures, Baarn, Holland. It forms brown to black mycelia on the surface of the must, and conidial suspensions survived temperatures up to 85° C. for ten minutes, being inhibited only at 90°.

Reid (D. A.). **A new species of Elsinoe parasitic on the fruits of a Terminalia.**—*Kew Bull., 1955*, 3, pp. 351–352, 1 fig., 1955.

A description is given of *Elsinoe indica* n.sp. on fruits of *Terminalia* (?) *chebula* imported from India for use in tanning leather. The three-septate ascospores measure 13 to 15·6 by 5 to 7 μ and are produced in subepidermal ascomata forming dark-brown, circular lesions up to 6 mm. in diameter.

Salquain (J.). **Protection permanente des textiles contre les attaques microbiologiques.** [Permanent protection of textiles against microbiological attacks.]—*Teintex*, 20, 8, pp. 609, 611–612, 615, 617–618, 621, 623–624, 627, 1955.

From a critical study of 49 contributions to the relevant literature the author concludes that the most effective durable protection of vegetable fibres against microbiological deterioration from bacteria, actinomycetes, and moulds (including *Cladosporium herbarum*, *Chaetomium globosum*, *Memnoniella echinata*, *Aspergillus oryzae*, and *A. niger*) is conferred by acetylation, cyanoethylation, and treatment with copper salts, which may be replaced by chlorophenols or zinc compounds where the colour of the copper products is objectionable.

Animal fibres should be treated with chromium compounds or products of the mitin type.

Kalmár (Z.). **A kalapos gombák mykorrhiza-kapcsolatainak gyakorlati jelentősége.** [The practical importance of the mycorrhizal associations of hymenomycetes.] —*Erdész. Tud. Int. Évk.* 2 (*1952*), pp. 277–291, 1954. [Russian, English, and German summaries. Abs. in *For. Abstr.*, 16, 4, p. 484, 1955.]

The author discusses the role of mycorrhiza in plant nutrition with particular regard to tree seedlings, including observations on the differences between ectotrophic associations of hymenomycetes [*R.A.M.*, 34, p. 802] in forests under continental conditions and those in northern countries. About 120 species forming a symbiotic association with one or more of 11 tree species in Hungary are tabulated. These were chiefly deciduous. Fungi forming permanent associations with more than two tree species include *Boletus scaber*, *B. rufus*, *B. edulis*, *B. regius*, *Amanita* [*Amanitopsis*] *vaginata*, *Amanita rubescens*, and *Russula cyanoxantha*.

In contrast to earlier reports no definite associations were observed in lime (*Tilia*), whereas with alder they were formed by *Lactarius controversus* and occasionally *B. lividus*.

Kljušnik (P. I.). **O gribah, obrazujuščih mikorizu Duba.** [Oak mycorrhizal fungi.] —*Lesn. Khoz.*, 5, 8, pp. 63–65, 1952. [Russian summary. Abs. in *For. Abstr.*, 16, 4, p. 484, 1955.]

Oak mycorrhiza in the Ukraine [cf. *R.A.M.*, 32, p. 443; 34, p. 312] were formed by several kinds of mycelium distinguished by their colour and morphology. In spite of their failure to produce sporophores in culture *Hebeloma crustuliniforme*, *Scleroderma aurantium*, and *Pisolithus arenarius* were identified on oak rootlets by comparison with naturally occurring mycelium bearing sporophores. By the autumn mycorrhizal mycelia were present on 79 per cent. of seedlings from surface-sterilized, spring-sown acorns artificially infected with *H. crustuliniforme* and on 88 per cent. with *S. aurantium*; 13 per cent. of the uninoculated developed mycorrhiza, presumably owing to incomplete sterilization of the acorns and soil. *Tricholoma lascivum* and *Cortinarius* sp. were confirmed as mycorrhiza new to oak by growing oak seedlings in jars of sterilized soil inoculated with fragments of freshly collected sporophores. The form in which mycorrhizal fungi are introduced when shelterbelt soils are inoculated with soil from oak woods was investigated by Cholodny's soil-slide technique. Mycelial growth progressed normally while the soil remained moist but when it began to dry the hyphae divided up into chlamydospores. When basidiospores from freshly collected sporophores of *H. crustuliniforme* were germinated between two glass slides buried 5 cm. deep in the soil, the germ-tubes of spores arranged in clusters united to form a single hypha but those of isolated spores grew into the nearest adjacent hyphae. The mycelium had no clamp connexions and was thinner than the usual forms, suggesting that the mycorrhiza form two morphological types of mycelium according to their origin.

Yokota (S. I.). **On several factors which affect the conidial characteristics of Fusarium solani (Mart.) App. et. Wr. I. On the concentration of media, temperature, and duration of incubation. II. On the concentration of the medium.** *Bull. Tokyo Univ. For.*, 45, pp. 155–164, 165–180, 1953. [Abs. in *Biol. Abstr.*, 28, 11, p. 2649, 1954.]

When *Fusarium solani* was grown in culture, the conidial size tended to diminish with increase of glucose in the media, formation of triseptate conidia ceasing when the concentration reached 5 per cent. Irregularly large conidia developed at 13° C., but it is recognized that size tends to increase with rise of the temperature of incubation.

When the concentration of the medium was changed continuously from N/10 to 5 N, marked differences in growth forms resulted. There was, however, very little difference in rate of radial growth as between the colonies. The rate of

appearance of tri- and biseptate conidia was lowest, and that of uniseptate conidia highest at N/2. A close relationship appeared to exist between variation in rate of appearance and variation in size. At N/2 the size of the tri- and uniseptate conidia had the lowest value. Variation in the rate of appearance and shape of the triseptate conidia were closely similar; variation in the rate of appearance of the uniseptate conidia tended to be the reverse of that of the triseptate.

Kalyasasundaram (R.) & Saraswathi Devi (Miss L.). **Synthesis of ascorbic acid by Fusarium vasinfectum Atk.** *Curr. Sci.*, 24, 8, pp. 273–274, 1955.

In cultural studies at the University Botany Laboratory, Madras, India, ascorbic acid was synthesized by *Fusarium vasinfectum* in appreciable quantities in the early stages of growth when sufficient zinc was supplied.

Wood Baker (Audrey). **Effects of oxygen-nitrogen mixtures on the spore germination of mucoraceous moulds.** *Trans. Brit. mycol. Soc.*, 38, 3, pp. 291–297, 1955.

In studies at Birkbeck College, London, the weak fermenters *Mucor hiemalis*, *Phycomyces blakesleeanus*, and *Rhizopus stolonifer* did not germinate in the absence of oxygen (*Bot. Rev.*, 16, pp. 229–257, 1950), but small increases in the percentage of oxygen in the gas stream circulating through the spore suspension resulted in some germination. *M. racemosus* and *M. rouxianus*, however, budded profusely and also germinated to some extent without oxygen, the percentage increasing as the oxygen concentration rose. The degree of germination in oxygen as compared with that in air varied with the species and the temperature employed. It appears that of the two stages in the germination of a spore, swelling and germ-tube formation, oxygen is only essential in the second.

Folsom (D.). **Testing Potato seedling varieties in Maine for field resistance to leaf-roll and for desirable horticultural characteristics.** *Amer. Potato J.*, 32, 10, pp. 372–385, 1955.

From 1938 to 1948 16,006 potato seedling varieties were tested for field resistance to leaf roll virus on Highmoor Farm, Maine [*R.A.M.*, 25, p. 573], by growing in rows adjacent to diseased plants. Many varieties were discarded before symptoms appeared on account of other undesirable properties. Of those which were saved an average of 75 per cent. contracted leaf roll within the first year of exposure. Control plantings of Chippewa, Green Mountain, and Katahdin developed, respectively, an average of 91, 75, and 57 per cent. infection in the first year, while the resistant B24-58 had only 7 per cent. Leaf roll spread varied yearly without apparent correlation with the frequency of insects. Resistance increased in varying degrees when resistant varieties were used as parents in crossing. Though field exposure was usually a less severe test than aphid inoculation [33, p. 442], a variety surviving the latter at Aroostook Farm was no better as a parent for transmitting leaf roll resistance than varieties resistant in the Highmoor Farm tests.

Seedling varieties resistant in Maine were equally so in other [unspecified] regions. The early maturing X1276-185 was grown commercially and proved superior in many ways to Chippewa.

Moericke (V.). **Über den Nachweis der Blattrollkrankheit in Kartoffelknollen durch den Resorzintest.** [On the demonstration of the leaf roll disease in Potato tubers by the resorcin test.] *Phytopath. Z.*, 24, 4, pp. 462–464, 4 figs., 1955.

At the Phytopathological Institute, University of Bonn, Germany, the application of resorcin blue to sections of potato tubers infected by leaf roll virus revealed extensive callose formation throughout the phloem [*R.A.M.*, 34, p. 747], in contrast to healthy material, in which there was only a thin covering over the sieve-plates.

In the diseased tubers, moreover, callose plugs frequently occupied adjacent sieve-tubes of a vascular bundle, instead of being isolated and not aggregated, as in the healthy ones.

Herbst (W.). **Ultrarotspektroskopische Untersuchungen an gesunden und viruskranken Kartoffeln.** [Infra-red spectroscopic studies on healthy and virus-diseased Potatoes.]—*Z. PflKrankh.*, 62, 6, pp. 370–375, 6 graphs, 1955. [English summary.]

In a preliminary study at the Institute for Physical Chemistry at the University of Freiburg, Germany, to determine the potential application of infra-red spectroscopy to the diagnosis of potato viruses, tubers and shoots affected by mosaic and leaf roll showed a stronger tendency than healthy ones to the formation in the spectra of bands attributed to phosphorus groups and nucleic acids. Further investigations are necessary to decide whether the method is sufficiently reliable to be used for the grading of seed potatoes.

Bartels (R.). **Serologische Untersuchungen über die Konzentration des X-Virus in Kartoffelstauden während der Vegetationsperiode.** [Serological studies on the concentration of the X-virus in Potato haulms during the growing period.]—*Phytopath. Z.*, 24, 4, pp. 421–430, 3 graphs, 1955.

At the Institute for Virus Serology, Brunswick, Germany, the concentration of potato virus X [cf. below, p. 333] in the haulms of secondarily diseased Flava potato plants [*R.A.M.*, 33, p. 497] was determined by serological methods at fortnightly intervals during the growing period. The virus titres in the shoots of the five haulms used in each test were low at first, reached a peak of 1 in 50 at the beginning of July, remained more or less constant at that level for about four weeks, and fell again with the onset of senescence. On the other hand, the concentration in the individual leaves, varied with the site of insertion and time of examination. For instance, at the inception of flowering the titre in the upper leaves of the main and side shoots rose to between 10 and 20 times the average, irrespective of leaf numbers and shoot size.

In a parallel series of tests under comparable conditions on third-year diseased plants of the same variety, identical trends were observed, no assured differences being demonstrated between the two groups in respect of the average concentration values of the whole plant.

Djokić (A. M.). **Prilog proučavanju degeneracije Krompira.** [Contribution to the study of Potato degeneration.]—*Arh. poljopr. Nauk.* [*Trans. Inst. Agron. Res.*], 7, 18, pp. 105–120, 4 figs., 3 graphs, 1954. [French summary.]

Studies on potato degeneration, carried out from 1950 to 1953, inclusive, at the Selection Station of the Faculty of Agriculture, Zemun, Yugoslavia, revealed that 'filosité' [spindle sprout: *R.A.M.*, 8, p. 194; 35, p. 223] in potato tubers is largely due to high air and soil temperatures in summer during the growth of the tubers. When grown under favourable conditions of temperature affected tubers give rise to others with normal sprouts, especially the varieties Oneida and Early Rose, which were grown in 1951, a year marked by heavy rain.

Spindle sprout tubers develop less vigorously than normal ones. Thus, with the 17 potato varieties tested only 43·87 per cent. plants were obtained from affected tubers during the summer plantings in 1950, 1951, and 1953, as against 100 per cent. from those that were normal, and 17·59 per cent. less plants grew from the former than from the latter in the spring plantings of 1952 and 1953, resulting in a substantial reduction of yield.

The spindle sprout tubers contained smaller percentages of dry matter (24·41) and starch (17·29) than normal tubers (25·38 and 18·39 per cent., respectively), and

during winter storage they lost slightly less in weight, 6·06 per cent. as against 7·42 per cent.

Bintje, Oneida, Böhms Mittelfrühe, Frühmölle, Sieglinde, and Eigenheimer were the most susceptible to spindle sprout.

Hyre (R. A.). **Three methods of forecasting late blight of Potato and Tomato in northeastern United States.**—*Amer. Potato J.*, 32, 10, pp. 362–371, 7 graphs, 1955.

In a comparison of three methods for the forecasting of late blight [*Phytophthora infestans*] of potatoes and tomatoes, hypothetical forecasts based on records from six stations in the north-eastern United States during the period 1949–54 showed that the method employing moving graphs derived from rainfall and temperature data [*R.A.M.*, 35, p. 121] was the most reliable [cf. next abstract].

Wallin (J. R.), Eide (C. J.), & Thurston (H. D.). **Forecasting Potato late blight in Minnesota.**—*Amer. Potato J.*, 32, 3, pp. 100–105, 1955.

From 1950 to 1953 potato late blight (*Phytophthora infestans*) was correctly forecast [see preceding abstract] for areas near weather-blight observation stations in Minnesota. The forecasts were based on periods of at least ten hours of continued temperature not exceeding 75° F. and relative humidity not less than 90 per cent., followed by temperature maxima below 95° F. One such period a week was considered sufficient for limited reproduction and subsistence of the fungus on the leaves. Further consideration is needed of the influence of high temperature maxima immediately succeeding a period favouring infection.

Howatt (J. L.) & Grainger (P. N.). **Some new findings concerning Phytophthora infestans (Mont.) de By.**—*Amer. Potato J.*, 32, 5, pp. 180–188, 1 fig., 1955.

The construction of two types of testing chamber used for determining resistance to *Phytophthora infestans* at Fredericton, New Brunswick [cf. next abstract], are described and illustrated. One is new and is of double glass with humidity and temperature control and fluorescent light. The floor is overlaid with glass wool batts which discourage mould growth. Sections for different races of the fungus are separated by polythene film which is used also for covering the trays lined with sphagnum moss on which the leaves are placed.

In a comparison of variously coloured potato leaves, from green to yellow or orange, from several potato varieties, the fungus was found to fruit only on living, green tissue, and it failed to do so on infected leaves that had been thoroughly frozen and then reinoculated [cf. *R.A.M.*, 5, p. 513], or on those placed on vermiculite in the damp chamber. After leaf brushing [cf. 33, p. 375] spore formation at 56° to 68° F. did not take place in under eight hours and it was greatest on whichever side of the leaf contacted the water-soaked moss and on green tissue adjacent to the previous spore-bearing area, unless this was exhausted by previous sporulation.

Inoculation experiments with four races of the fungus on Black's, Mastenbroek's, and Mills's differentials [34, p. 56] and on crosses of *Solanum demissum* and *S. tuberosum* [see below, p. 320] gave results (described in detail) inconsistent with the generally accepted scheme, which suggests that certain differential hosts proposed in the International System [33, p. 250] are possibly not genotypic equivalents and indicates the difficulty of designating races by this system.

Seedlings from a number of crosses between wild species of *Solanum* tested against race (1, 2, 3, 4) showed resistance, but no commercial varieties or seedlings did so.

Hoyman (W. G.). **A chamber with automatic temperature and humidity controls for testing resistance of Potatoes to the fungus causing late blight.**—Abs. in *Amer. Potato J.*, 32, 10, p. 391, 1955.

For testing potatoes for resistance to *Phytophthora infestans* in the greenhouse [at the North Dakota Agricultural Experiment Station, Fargo] an inoculation

chamber 6 ft. high by 13 by 7½ ft. was constructed using 0·005 in. Bakelite plastic film supported on a wooden frame [cf. preceding abstract]. A humidifier was suspended from the roof, and an electronic humidistat gave very satisfactory control. Chamber temperatures of 68° to 72° F. were maintained at greenhouse temperatures of about 100° by a window-type, room air conditioner controlled by a thermostat.

Hirst (J. M.). **The early history of a Potato blight epidemic.** –*Plant Path.*, 4, 2, pp. 44–50, 2 diags., 1 chart, 1955.

In an experiment at Rothamsted Experimental Station to investigate an outbreak of potato blight (*Phytophthora infestans*) [*R.A.M.*, 37, p. 56] from the start, a plot was planted on 13th April, 1954, with nine rows of potatoes 28 in. apart, 82 tubers being spaced 16 in. apart in each row. Rows, A,B,D,F,H, and I were guards, planted with healthy, unsprouted Majestic tubers. Rows C, E, and G were planted with sprouted tubers infected with *P. infestans*. All the tubers in row C and 35 at the west end of E were Ulster Cromlech; half were inoculated on 8th February and half on 3rd March, a quarter being inoculated at the rose end and a quarter at the heel each time. The east end of E contained 47 naturally infected Majestic tubers, and G had 13 King Edward and 69 Ulster Chieftain tubers, all naturally infected in 1953. All the tubers had live sprouts when planted, but the infection to some extent prevented normal sprouting subsequently.

The first lesion was noted on 28th May, when most of the sprouted, diseased tubers had produced sprouts up to 6 in. high. Fewer of the healthy Majestic plants had appeared and the mean height of those which had was under 2 in. *P. infestans* was first found on a shoot 3 in. high, produced by an Ulster Cromlech tuber (C23) which had been artificially inoculated in the rose end on 3rd March. By 3rd June, the whole shoot was dead, except for the basal leaf and the portion of the stem to which it was attached; a weak, but apparently healthy shoot had grown in its axil. On 9th June, sporangia were present.

The earliest secondary infection was found on 9th June on plant E 37 when the single shoot was 10 in. high. This infection was almost certainly due to an airborne sporangium. On 11th June, a similar lesion was found on plant E 22. On 14th June, small lesions, chiefly on the lower leaves, were noted on plants C 23, E 22, or plants near them, but none were seen near E 37. Subsequent flushes of infection became progressively larger, causing more lesions and affecting more plants; the result was an obvious patch of diseased plants.

Apart from C 23, only one plant bore a lesion suspected to have arisen from the parent tuber. This Ulster Cromlech tuber (C 6) was also inoculated in the rose end on 3rd March, and the lesion was first observed on 6th July, when a small group of plants in the vicinity was already infected. By 15th July, foliage infections on the plot were so numerous that this plant could be lifted without materially affecting the amount of inoculum present. *P. infestans* was present in the stem below ground, but no connexion could be established between the lesion and the fungus in the tuber. Even if this infection is regarded as developing from the fungus in the tuber, only two such infections developed from 246 diseased tubers planted.

All the primary infections were traceable to diseased shoots produced only by artificially inoculated tubers and by under 1 per cent. of all the diseased tubers planted. Subsequent local infections, produced at frequent intervals, clearly showed the position of the primary source before blight became general in the district. At this time, plants near the primary source were more than half defoliated, whereas those at a distance bore only a few lesions. The experiment showed that infections almost always occur during crop-level Beaumont warnings [27, p. 88], including the 'premature' ones in June. Beaumont suggested that blight would be present two to three weeks after the first warning, but this period may not allow

the fungus time to spread sufficiently from the true initial sources, generally distributed throughout the crops. In 1954, a wet year, this phase occupied two months, during which there were six flushes of infection. The zero date necessary in practical forecasting may, perhaps, have biological significance if it generally represents the date when distant spread replaces local spread round a primary source of the fungus.

Ferris (Virginia R.). **Histological study of pathogen-suscept relationships between Phytophthora infestans and derivatives of Solanum demissum.**—*Phytopathology*, 45, 10, pp. 546–552, 6 figs., 1 graph, 1955.

The physiologic races of *Phytophthora infestans* used in these studies at Cornell University, Ithaca, New York, the results of which have been noticed [*R.A.M.*, 34, p. 809], were 0, 1, 2, and 1,4, cultured on Lima bean agar and maintained at 18° C. The test varieties were Green Mountain and Essex (genotypes r and R1, respectively), and the selections FOL–7 (R2), 3 WN–4 (R4), 3 WM 19 (RIR4), DFR–4 (RIR1), and 3 RD–5 (R2R2). The resistant material originated from crosses between *Solanum demissum* and the cultivated potato.

Hirst (J. M.), Long (I. F.), & Penman (H. L.). **Micrometeorology in the Potato crop.**—*Proc. met. Conf., Toronto, 1953*, pp. 233–237, 2 graphs, [? 1954. Received 1955.]

One of the problems involved in the study of potato virus diseases and of blight [*Phytophthora infestans*] is the accurate determination of the microclimate around the plants as it affects the aphid vectors of the viruses, and the conditions under which condensation can occur on the leaves to form a film of water favourable for blight [*R.A.M.*, 34, p. 56]. In work on the aphid problem [cf. 29, p. 379] it has been shown that with an 8 m.p.h. wind at 2 metres, ventilation in the crop rarely exceeded 4 m.p.h., while with a 3 m.p.h. wind it was rarely more than $\frac{1}{2}$ m.p.h. Thus weather inside the crop often favours aphid activity when that outside does not, but occasional aphids flying in the crop might be carried considerable distances to form new foci of infection.

Tedin (O.). **Växtförädling och växtskydd. (Föredrag vid Sveriges Utsädesförenings årsmöte i Svalöf den 19 juli 1955).** [Plant breeding and plant protection. (Lecture delivered at the Annual Meeting of the Swedish Seed Association at Svalöf on 19th July, 1955).]—*Sverig. Utsädesfören. Tidskr.*, 65, 5, pp. 309–322, 1955. [English summary.]

Of recent years the question of plant protection against diseases and pests has attracted increasing attention in Sweden, where there is a general demand for improved working facilities in this branch of agricultural science. One method of disease control consists in the breeding of resistant varieties, e.g., of potatoes against blight (*Phytophthora infestans*) [*R.A.M.*, 33, p. 175 and next abstract], up-to-date information on which is presented.

Two main trends in breeding for resistance may be differentiated, one aimed at obtaining complete resistance in the laboratory, which frequently necessitates a search for appropriate genes in exotic varieties or even in wild species, and the other directed towards the discovery of natural varieties with sufficient field resistance substantially to reduce the damage from the pathogen. Successful application of the former method results in absolute resistance in the field, which is, however, confined to certain biotypes of the fungus, others being capable of attacking the 'resistant' variety [33, p. 250 *et passim*]. On the other hand, the type of resistance developed by the second procedure (the only one used so far in Sweden) seems to be more independent of variations in the pathogen. To cite an example, the German variety Ackersegen, though carrying none of Black and Mastenbroek's R genes [loc. cit.], is highly resistant to *P. infestans* in the field. Moreover, its behaviour

in this respect has remained unchanged at Svalöf of recent years, despite the presence there of physiologic race 4 and the appearance in 1954 of race 1.

Björkling (K.) & Sellgren (K. A.). **Deposits of sporangia and incidence of infection by Phytophthora infestans on upper and lower surfaces of Potato leaves.**—*Acta agric. scand.*, 5, 4, pp. 375–386, 6 figs., 1955.

Studied by means of a special method involving the use of collodion films at the Royal College of Agriculture, Uppsala, Sweden, about 10 times as many sporangia of *Phytophthora infestans* [see preceding abstract] were found deposited on the upper as on the under leaf surfaces in the initial stage of potato blight outbreaks. The deposit is increased considerably with progressive attacks, and in susceptible varieties, e.g., Early Puritan, Up to Date, Bintje, and Mandel, more rapidly on the upper than on the lower surfaces of middle and basal leaves. The ratios of infection incidence on prepared and stained material were uniformly lower than the corresponding values for sporangial deposits. In mild attacks there were about seven or eight times as many infections on the upper as on the under surfaces of both susceptible and resistant varieties, such as Placid. In progressive attacks on susceptible varieties infection increased more rapidly on the lower than on the upper surfaces, and it seems advisable, therefore, that both sides should be coated with a fungicide as soon as the first symptoms appear [*R.A.M.*, 33, p. 175].

Kaiser (W.) & Klingler (H.). **Neuere Erfahrungen über das Auftreten und die Bekämpfung der Krautfäule (Phytophthora) der Kartoffel.** [Recent observations on the occurrence and control of Potato blight (*Phytophthora*).]—*Gesunde Pfl.*, 6, pp. 161–163, 1954. [Abs. in *Z. PflKrankh.*, 62, 4, pp. 253–254, 1955.]

The examination of 383 lots of early and medium-early potatoes from the Rhine-Main region of Germany revealed only physiologic race A [race 0: *R.A.M.*, 33, p. 251] of *Phytophthora infestans* [31, p. 138 and next abstract], whereas B [race 4: 33, p. 205] constituted 20 to 25 per cent. of the infective material harboured by the medium-late and late varieties. The cultivated potato varieties are divided into three groups, (1) field-resistant, (2) hybrids, and (3) K-varieties, the last-named being normal [*Solanum*] *tuberosum* derivatives which are again subdivided according to their capacity for resistance. The late appearance of race 4 is attributed to adaptation, overwintering of the fungus in this form being considered improbable.

Spraying twice with copper oxychloride (in June and July) damaged the plants so severely that production was reduced by 20 per cent. In this season, however, the disease assumed a mild form and did not appear until the beginning of August. In the following year the same treatment resulted in a 15 per cent. increase.

Christiansen-Weniger (Eva). **Versuche zur stoffwechselphysiologischen Beeinflussung der Reaktion der Kartoffelknolle auf Phytophthora infestans de By.** [Experiments in the metabolic-physiological modification of the reaction of the Potato tuber to *Phytophthora infestans* de By.]—*Phytopath. Z.*, 25, 2, pp. 153–180, 1955.

This is a comprehensive, fully tabulated account, preceded by a survey of the pertinent literature, of experimental studies at the Institute for Phytopathology and Plant Protection, University of Göttingen, Germany, on the effects of the infiltration of various more or less specific enzyme-inhibitors, at concentrations of 10^{-3} to 10^{-5} M., on the reactions of potato tubers to race A [race 0] of potato blight (*Phytophthora infestans*) [*R.A.M.*, 29, p. 380 and preceding abstract].

Fructification and growth of the fungus on the normally resistant Aquila variety were made possible through inhibition of the polyphenoloxidase by sodium azide, phenyl urethane, sodium fluoride, potassium cyanide, sodium diethyldithiocarbanate, paranitrophenol, thiourea, salicylaldoxim, and kupferron. On the same

variety the development of the pathogen was promoted by the inhibition of respiration induced by pyrocatechol and tyrosine. Protocatechuic and chlorogenic acids suppressed both reproduction and growth of *P. infestans* on the susceptible Erdgold. Sodium fluoride, an inhibitor of enolase, reduced both the sporulation of the organism and its capacity to penetrate Erdgold tubers. Sporulation on the same variety was also prevented as a result of interruption of the tricarbonic acid cycle by malonic acid and malachite green, but colonization of the tuber proceeded unchecked. The infiltration of pyroracemic, succinic, malonic, and fumaric acids enabled the fungus to form sporangia on Aquila and expedited the process on Erdgold.

Gorlenko (S. V.). К вопросу о физиологии прорастания зимних зооспорангиев возбудителя рака картофеля. (**Synchytrium endobioticum (Schilb.) Percival**). [Concerning the physiology of growth of the winter sporangia of the causal agent of Potato wart (*Synchytrium endobioticum* (Schilb.) Percival).]—Докл. Акад. сельскохоз. Наук Ленина [*Rep. Lenin Acad. agric. Sci. = Proc. Lenin Acad. agric. Sci.*], **20**, 4, pp. 18–22, 1955.

Studies on the growth of zoosporangia of the potato wart fungus *Synchytrium endobioticum* [*R.A.M.*, 34, p. 810] in the U.S.S.R. showed that extracts from plant tissues, root exudates, and organic fertilizers, particularly poultry manure, containing bios (biotin), vitamin B_1 in particular considerably stimulate the growth and maturation of dormant, winter zoosporangia. These substances might thus be used for the artificial stimulation of maturation of the zoosporangia.

Vaisey (E. B.), Carpenter (J. A.), & Atkinson (R. G.). **Pigment production in skim milk by actinomycetes in relation to Potato scab.**—*Canad. J. Microbiol.*, **1**, 7, pp. 574–578, 1955.

In co-operative tests at the Ontario Agricultural College and the Botany and Plant Pathology Division, Canada Department of Agriculture, Ottawa, of actinomycetes from potato scab lesions 37 isolates out of 39 which gave the brown ring reaction on separated milk [*R.A.M.*, 26, p. 290] were identified as *Streptomyces* [*Actinomyces*] *scabies* by the production of scab on Katahdin. When actinomycetes from soil were tested, however, only six of the 43 isolates producing a brown ring were pathogenic.

Hoffmann (G. M.). **Zur Methodik der Schorfresistenzprüfung von Wildkartoffeln.** [On the technique of testing wild Potatoes for scab resistance.]—*Phytopath. Z.*, **24**, 4, pp. 465–468, 2 figs., 1955.

Unlike the cultivated varieties, wild potatoes cannot be conveniently tested for reaction to *Streptomyces* [*Actinomyces*] *scabies* in pots with a hole in one side [*R.A.M.*, 34, p. 316], and the following method was therefore devised at the Institute for Phytopathology, Aschersleben, Germany. The plants are grown in a mixture of equal parts of compost and sand in 10-cm. flower pots in a greenhouse. After a period varying with the different species of *Solanum*, several stolons will usually be found encircling the ball of soil in the pot, two to four of which are carefully arranged to hang over the edge after the plant has been re-potted. Half the stolons are then inserted in test-tubes to which are added a few ml. of a highly concentrated spore suspension of the pathogen, while the others are moistened with distilled water in a similar manner and used as controls. The test-tubes are sealed with cotton wool plugs and covered with black paper to exclude light, which turns the stolons green. The first symptoms of infection, appearing within a few days, consist of punctiform, brown discolorations, which expand, coalesce, and often cover entire areas of the stolon. As a rule mycelium is produced simultaneously and forms a grey covering over the lesions.

Spatz (L.). **Mangansulfat-Spritzung bei Kartoffeln.** [Manganese sulphate spraying of Potatoes.]—*Mitt. dtsch. Landw.-Ges., Frankfurt*, 69, 17, p. 406, 1955.

During the last four years potatoes on sandy moorland soil in the Lüneburg Heath district of Germany have sustained heavy damage from manganese deficiency [*R.A.M.*, 19, p. 302]. In 1953 very satisfactory control was achieved by one application (on 10th June) to the severely affected Erntedank variety on a plot covering 50 sq. m. of a manganese sulphate spray at a dosage of 6 kg. per ha., the tuber and starch yields being increased from 238 to 328 and from 29·5 to 45·9 doppelzentner [1 dz. = 100 kg.] per ha., respectively, as compared with the untreated. Incidentally, the percentage of tubers heavily infected by scab [*Actinomyces scabies*] was reduced from 70 to 20 per cent. by the manganese sulphate treatment.

Ayers (G. W.). **The resistance of Potato varieties to storage decay caused by Fusarium sambucinum f.6 and Fusarium caeruleum.**—Abs. in *Amer. Potato J.*, 32, 10, p. 386, 1955.

Moderate to high resistance to *Fusarium sambucinum* f.6 [*Gibberella cyanogena*: *R.A.M.*, 35, p. 122] was demonstrated in the potato varieties Essex, Houma, Cherokee, Irish Cobbler, Pungo, Menominee, Warba, Cayuga, and Merrimack, and to *F. caeruleum* [33, p. 557] in Essex, Merrimack, Ontario, Green Mountain, Snowflake, Cherokee, Early Gem, Kennebec, and Menominee [at the laboratory of Plant Pathology, Charlottetown, Prince Edward Island, Canada.]

Bonde (R.). **Further studies on the control of bacterial decay of Potato seed pieces with antibiotics.**—Abs. in *Amer. Potato J.*, 32, 10, p. 387, 1955.

Further experiments [in Maine] demonstrated that 9,000 lb. or more of cut seed potatoes could be treated against *Erwinia atroseptica* in 100 gals. agrimycin 100 solution, which gave complete control at a concentration as low as 25 p.p.m. [*R.A.M.*, 35, p. 39]. Streptomycin nitrate at 25, 50, and 100 p.p.m. was less effective.

Aycock (R.). **The effect of certain post storage treatments on soft rot development in Sweetpotatoes.**—*Plant Dis. Reptr.* 39, 5, pp. 409–413, 1955. [Multilithed.]

At Clemson Edisto Experiment Station, Blackville, South Carolina, dipping sweet potato roots in 2·5 per cent. borax solution or soaking for ten minutes in 1 per cent. reduced soft rot (*Rhizopus* sp.) [*R.A.M.*, 32, p. 33] from 14·9 (untreated) to 0·8 and 1·5 per cent., respectively. The roots had been stored for at least three months and were repacked after treatment. A significant reduction in soft rot was also obtained when roots were removed from storage, graded, and repacked, and then recured at 85° F. and 60 per cent. relative humidity or above for 24 hours before replacement in storage at 50° to 60°. Recuring for 96 hours was even more effective. Recuring for 48 or 72 hours immediately after hauling repacked sweet potatoes 80 miles by truck significantly reduced soft rot, as did 1 per cent. borax treatment either before or after transit.

Young (H. E.). **Diplodia dieback and collar rot of Hevea and blue spot of crêpe Rubber.**—*Quart. Circ. Rubb. Res. Inst. Ceylon*, 30, 3–4, pp. 81–83, 1955.

The information in this paper on die-back and collar rot of *Hevea* rubber trees in Ceylon, caused by *Botryodiplodia theobromae*, and of blue spotting of crêpe rubber, caused by the same fungus, has already been noticed from another source [*R.A.M.*, 34, p. 544].

Young (H. E.). **White root disease of Hevea (Leptoporus lignosus = Fomes lignosus).**—*Quart. Circ. Rubb. Res. Inst. Ceylon*, 30, 3–4, pp. 84–91, 1955.

A brief, popular account is given of white root rot of *Hevea* rubber trees in Ceylon,

caused by *Fomes lignosus* [*R.A.M.*, 34, p. 543], the points dealt with including the geographical distribution of the fungus; species affected; nature, fruiting bodies, and habits of the organism; method of attack; acute and chronic (or latent) infection; control (by eradication) [34, p. 61]; precautions to be taken in replanting old rubber areas; poisoning of old rubber before replanting; and nursery infections. [This paper also appears as *Adv. Circ. Rubb. Res. Inst. Ceylon* 46, 8 pp., 1954.]

Fernando (D. M.). **Phytophthora leaf disease and stem dieback of Hevea.** —*Quart. Circ. Rubb. Res. Inst. Ceylon*, 30, 3–4, pp. 92–95, 1 fig., 1955.

A succinct account is given in popular terms of leaf disease and stem die-back of *Hevea* rubber trees in Ceylon, caused by *Phytophthora palmivora*. It is stated that in South America zineb was found to give better control of both *Dothidella ulei* [cf. *R.A.M.*, 33, p. 178] and *P. palmivora* than copper sprays; it is used against *D. ulei* at the rate of 1 to 2 lb. per 100 gals., applications being made every eight days. In laboratory tests ferbam displayed high toxicity to *P. palmivora*. [This paper also appears as *Adv. Circ. Rubb. Res. Inst. Ceylon* 45, 4 pp., 1 fig., 1954.]

Constable (D. H.). **Manuring, magnesium deficiencies in Rubber.**—*Quart. Circ. Rubb. Res. Inst. Ceylon*, 30, 3–4, pp. 96–98, 2 figs., 1955.

In Ceylon, heavier potash manuring is a contributory factor in magnesium deficiency of *Hevea* rubber trees [cf. *R.A.M.*, 34, p. 814]. The remedy is to supply additional magnesium. For normal manuring dolomitic lime (not less than 20 per cent. magnesium) should be broadcast in the root feeding circle at the rate of $\frac{1}{2}$, $1\frac{1}{2}$, and 3 lb. per tree in the first, third, and fifth year, respectively, or manurial mixtures should contain one-third of a part of magnesium oxide for every one part of potassium oxide.

When deficiency of magnesium is evident, 2 lb. of dolomitic lime may be forked in per tree, or quicker results obtained by using $1\frac{1}{2}$ lb. dolomitic lime with $\frac{1}{2}$ lb. of magnesium sulphate, or applying of the magnesium sulphate as a spray (2 lb. to 10 gals.) two or three times at weekly intervals, with a sticker.

Constable (D. H.). **Potassium deficiencies.**—*Quart. Circ. Rubb. Res. Inst. Ceylon*, 30, 3–4, pp. 99–102, 1 fig., 1955.

After briefly discussing some cases of potassium deficiency of *Hevea* rubber trees in Ceylon [cf. *R.A.M.*, 34, p. 814], the author states that in some of them heavy applications of nitrogen (290 lb. of sulphate of ammonia per acre) greatly aggravated the condition; this in turn reduced the nitrogen intake, and the final result was severe nitrogen starvation. In young clearings the best treatment is to apply a mixture of 100 lb. sulphate of ammonia, 100 lb. saphos [phosphate], and 80 lb. muriate of potash four times a year (first year trees, 1 lb. per annum; second to sixth years, 2–3 lb.; seventh year onwards, 4 lb.). In mature clearings quantities of 2 to 4 lb. each of muriate of potash and sulphate of ammonia are required. Half-pound applications of each should be made every two months from March to October, according to the weather, and must be worked below the soil surface. Unless the deficiency is very mild the applications should be continued over two years. The PB86 clone is particularly susceptible both to potassium and to magnesium deficiency. [This paper also appears as *Adv. Circ. Rubb. Res. Inst. Ceylon* 37 *b* (*Suppl.* to *Adv. Circ.* 37), 4 pp., 1 fig., 1954.]

Munasinghe (H. L.). **A wart disease of Desmodium ovalifolium caused by a species of Synchytrium.** —*Quart. Circ. Rubb. Res. Inst. Ceylon*, 31, 1, pp. 22–28, 2 pl., 1955.

In the wetter rubber-growing areas of Ceylon *Desmodium ovalifolium*, a ground-cover plant for *Hevea* rubber, is widely affected by a species of *Synchytrium*.

Aggregations of minute galls formed by the abnormal displacement of the epidermis develop just below the stem apex and sometimes extend downwards. Infection of the petioles and leaf blade, mainly along the midrib and veins, is common. The normal growth of the shoot is arrested, the part below the terminal bud becomes swollen and distorted, and the shoot dies. The disease spreads only during wet periods; in between the plants recover. The galls turn dull yellow in a few days, those in which resting sporangia form becoming dark brown; they are mostly hemispherical, but often spheroid, and measure 0·1 to 0·5 mm. in diameter. Inoculation with zoospores from resting sporangia and with tissue containing summer sporangia produced infection in potted *D. ovalifolium* plants in conditions of very high humidity.

The fungus, which is named *S. desmodiae* n. sp., has hyaline, spherical zoospores 1·4 to 6 μ in diameter with flagellae 2 to 6 μ long. The yellow summer sporangia have a thin, hyaline wall, are polygonal but roughly spherical, and measure 16 to 25 μ in diameter. The resting sporangia are oval, thick-walled, brown, and 64 to 176 by 57 to 96 μ.

Camp (A. F.). **Minor element problems. I and II.**—*Agric. Chemic.*, 8, 5, pp. 38–40, 123, 125; 6, pp. 50–52, 1953.

This is an interesting survey of some problems associated with the development of minor element deficiencies in various parts of the United States. Instances are cited of the anomalous behaviour of crops attributable to such deficiencies. For example, on soils cultivated for many years, maize could be grown satisfactorily only every second or third year, and then only when alternated with weeds. The weeds had a high zinc content whereas that of maize was comparatively low. Zinc sulphate applied at ten to 15 lb. per acre enabled a good crop of maize to be grown every year [cf. *R.A.M.*, 35, p. 292].

In some citrus-growing areas in Florida [33, p. 26; 35, p. 98] the fertilizer programme includes all the known plant nutrients. Every year the proportion of soils needing additional nutrients increases.

In the second part of this paper the methods of application of the various minor elements are discussed.

Bear (F. E.). **Iron chelates.**—*Agric. Chemic.*, 10, 7, pp. 34–35, 107–109, 3 figs., 1955.

This article gives a further account in popular terms of the action of iron chelates. The information which it contains has mostly been noticed already from other sources [cf. *R.A.M.*, 35, 235].

Thornton (H. G.). **Soil microbiology department.**—*Rep. Rothamst. exp. Sta., 1953*, pp. 64–67, 1954.

In studies by I. L. Stevenson of ten actinomycetes active against root disease fungi, especially *Helminthosporium sativum* [*R.A.M.*, 33, p. 754], the addition of bentonite to agar media greatly reduced antibiotic activity, though kaolin had little effect. The reduction effected by soil varied with the soil type and the species of actinomycete. Species whose antibiotic properties in agar were least affected by the addition of soil displayed the most consistent antibiotic activity when grown in the soil itself. Four strains tested were identified as *Streptomyces antibioticus*. Pot experiments with wheat grown in sterilized soils confirmed that root rot by *H. sativum* was significantly reduced by some of the strains; this reduction was in general related to the activity of the strains *in vitro*.

Further work by F. A. Skinner on the competition between an actinomycete [*Streptomyces albidoflavus*] and *Fusarium culmorum* [33, p. 629] demonstrated a greater reduction in fungal growth in media rich in energy supply than in those

poor in it. This applied whether antagonism was attributable to antibiotic action or to competition for some available nutrient. The effect may be important where it is desired to introduce and establish an antagonist in a fresh soil in competition with the natural micro-population.

VENKATA RAM (C. S.). **Soil Fusaria and their pathogenicity.**—*Proc. Indian Acad. Sci.*, Sect. B, 42, 4, pp. 129–144, 1 pl., 1955.

An investigation was carried out by the author at Madras University into the part played by different species of *Fusarium* in causing disease of cotton and pigeon pea, and the identity of the fungi involved [cf. *R.A.M.*, 35, p. 281]. Of the 14 species isolated from soils in 11 fields of the Coimbatore and Tirunelveli districts of southern India, the most common were *F. chlamydosporum*, *F. culmorum*, *F. oxysporum*, and *F. solani*. *F. camptoceras*, *F. dimerum*, *F. sporotrichioides*, and *F. tricinctum* were new records for southern India, and the two latter for the whole of India. In addition to *F. vasinfectum* and *F. udum*, *F. solani*, *F. culmorum*, and *F. oxysporum* comprised strains pathogenic to cotton and pigeon pea, as well as others non-pathogenic. The other species were not pathogenic to either crop. Certain isolates of *F. udum* and *F. vasinfectum* could infect both cotton and pigeon pea.

It is pointed out that the species of *Fusarium* occurring in the soil show considerable variability in their pathogenicity, a variation which may far exceed that of morphological characters, so that it is difficult to draw lines of demarcation indicating host specificity [cf. 25, p. 366].

WARCUP (J. H.). **On the origin of colonies of fungi developing on soil dilution plates.**—*Trans. Brit. mycol. Soc.*, 38, 3, pp. 298–301, 1955.

At the Waite Institute, Adelaide, South Australia, the following method was devised for determining the nature of the propagules that give rise to individual fungus colonies on soil dilution plates [cf. *R.A.M.*, 34, p. 546]. Such plates, of clear, filtered Dox plus yeast agar (pH 4·2 to 4·4) were incubated for 18 hours at 25° C. and then searched for young colonies, each of which was removed in a small block of agar for direct microscopic examination. After the nature of the propagule, whether spore or hypha, had been determined, the block was returned to a fresh medium so that growth could continue and the fungus be identified. By this method the majority of the colonies developing on the plates were found to have arisen from spores.

FARROW (W. M.). **A new species of Chaetoceratostoma.**—*Mycologia*, 47, 3, pp. 416–419, 5 figs., 1955.

Chaetoceratostoma longirostre n. sp., isolated repeatedly from soil samples collected in the Panama Canal Zone and Panama in 1952 [cf. *R.A.M.*, 34, p. 319], has dark brown, ovoid, membranous perithecia, 148 to 205 by 74 to 118 μ with a long neck, clavate to cylindrical, evanescent asci, 24 to 43 by 12 to 19 μ, and hyaline, later dark brown, sub-globose, apiculate ascospores, 8·9 to 12 by 8·5 to 10·2 μ.

LEGG (J. T.). **The spread of nettlehead disease and its association with split leaf blotch virus in certain Hop varieties.**—*Rep. E. Malling Res. Sta., 1954*, pp. 128–132, 1955.

In a field in the West Midlands planted in the winter of 1948–49 nettlehead virus spread at different rates among clones of the new hop varieties College Cluster, Brewer's Standby, Quality, Malling Midseason, Bullion, Concord, and the Fuggle clones Jubilee and Y, either because they all differ genetically in their resistance to this disease, or possibly because nettlehead is caused by a complex of viruses of which split leaf blotch [*R.A.M.*, 31, p. 84] is a component, the subsequent suscepti-

bility to nettlehead being related to initial infection with split leaf blotch virus. The records indicated latent infection by split leaf blotch in the two Fuggle clones and suggested that the other six varieties were potential carriers, but the evidence for the suggested virus complex was inconclusive.

YAMAMOTO (W.), OMATSU (T.), TAKAMI (K.). **Studies on the corm rots of Crocus sativus L. I. On the saprophytic propagation of Sclerotinia gladioli and Fusarium oxysporum f. gladioli on various plants and soils.**—*Sci. Rep. Hyogo Univ. Agric.* (Agric. Ser.), 1, 2, pp. 64–70, 1954. [English summary.]

Corm rots due to *Sclerotinia gladioli* and *Fusarium oxysporum* f. *gladioli* have been found on *Crocus sativus* in the Hyogo prefecture, Japan, where they can cause considerable damage. The fungi grow readily in garden soil mixed with rice, wheat, or barley bran, but not in garden soil alone. In infected fields the fungi occur in soil and on plant debris, producing sclerotia or spores.

YAMAMOTO (W.). **Studies on the corm rots of Crocus sativus L. II. On the antagonistic action of Trichoderma fungi against the causal fungi of corm rots.**—*Sci. Rep. Hyogo Univ. Agric.* (Agric. Ser.), 1, 2, pp. 123–128, 1954. [English summary.]

The antagonistic action of 20 strains of *Trichoderma* fungi against *Armillaria mellea*, *Sclerotinia gladioli*, *S.* sp., and *Botrytis* sp. is described. The mycelial growth of the *Trichoderma* strains varied, but most of them produced abundant conidia over the colonies of *S. gladioli* and had almost destroyed the mycelium of this fungus seven days after inoculation. Similarly, most of the strains invaded and destroyed the colonies of *Botrytis* sp. within 14 days of inoculation.

MUNGOMERY (R. W.). **Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd* 54, pp. 59–79, 22 figs., 2 graphs, 1954.

Most of the information by C. G. HUGHES on sugar-cane ratoon stunting disease in the disease investigations section (pp. 68–79) of this report [cf. *R.A.M.*, 34, p. 630] has already been noticed in this *Review* [35, p. 235]. In experiments in 1952 the varieties C.P. 29/116,C.P. 36/183, D. 166·34, P.O.J. 2961, P.O.J. 2967, P.O.J. 3016, and Q. 50, were inoculated in the sett but did not show any stunting in the subsequent plant or ratoon crop.

Chlorotic streak was recorded for the first time in several parts of the Mackay area. Leaf scald (*Bacterium* [*Xanthomonas*] *albilineans*) was absent from all the stools of the commercial canes N.Co. 310, Q. 28, Q. 42, Q. 47, Q. 50, and Vesta during the two inspections in December, 1953, and February, 1954. Fiji disease was absent from the Bundaberg district in the 1953 to 1954 season.

The *Sclerospora* disease (*S. macrospora*) [34, p. 107] was recorded for the first time in the Mackay district. *Verticillium* sp. [34, p. 183] was isolated from a further series of specimens from various parts of the State. Temperature relationship studies showed that it has a marked peak growth rate between 27° and 31° C.

MUNGOMERY (R. W.). **Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd* 55, pp. 62–80, 17 figs., 1955.

In the section of this report [see preceding abstract] dealing with disease investigations (pp. 72–80) D. R. L. STEINDL notes that ratoon stunting caused losses from 3 to 11 tons per acre to the sugar-cane varieties Pindar, P.O.J. 2878, N.Co. 310, Trojan, and Vidar [see next abstracts]. Q. 50, usually tolerant of the disease in the Mackay area, showed some yield reduction in one trial in South Queensland. Losses due to the disease were inconsistent in Badila, Comus, and S.J. 16, suggesting that these may have some tolerance. Poor germination, retarded early growth, and reduction in the length of the stalk in the affected plots, rather than reduced thickness or number of stalks, were mainly responsible for the differences in yields.

The standard hot-water treatment at 50° C. for two hours proved inefficient in a very small percentage of setts in certain varieties, probably owing to some physical property of these, such as thickness, woodiness, or pithiness. The following disinfectants [cf. 34, p. 818]: alcohol (ethyl, 50 per cent.), aretan (3), calcium hypochlorite (10), dettol (chloroxylenol, 0·5 to 2·5), formaldehyde (4), lysol (0·5 to 2·5), mercuric chloride (0·1), phenol (1 to 2·5), phenyl (1·66 to 2·5), potassium permanganate (1), and zephiran (0·05 to 0·5), all inactivated the stunt virus after 10 minutes' exposure. Dipping knife-infected setts into a disinfectant was not effective. Young plants of Q. 28 were easily infected when roots were cut with a knife smeared in infective juice. The virus was shown to occur in the leaves, stems, and roots and remained infective in a dilution of one part in 10,000. Differences in the intensity of discoloration [see below] in the vascular bundles in setts of Q. 28, Q. 44, Q. 50, and G. 176, inoculated with infected juice, suggest that there are different strains of the virus. Extracts from inoculated maize, sorghum, and sweet sudan grass, though these hosts showed no symptoms, reproduced the disease in Q. 28. The positive identification of the disease in some varieties is still a problem, the absence of symptoms not necessarily indicating a healthy cane.

Chlorotic streak was still serious in the low-lying, wetter districts. Its spread is believed to be associated with actual inundation of the cane fields.

Leaf scald (*Xanthomonas albilineans*) was absent from Co. 475, Q. 50, Q. 56, and Q. 58, all of which appeared to be resistant.

Pineapple disease (*Ceratostomella* [*Ceratocystis*] *paradoxa*) [35, p. 235] was controlled with various mercurials, which resulted in satisfactory germination and were superior to dettol and zephiran. The cutter-planter with treatment attachments was used in preference to dipping the cut setts.

Further decline in Fiji disease incidence is reported. The disease has again been absent from the Bundaberg area. Q. 56 is stated to be very susceptible.

A species of *Verticillium* was responsible for poor ratooning and weak growth of stools in the Bundaberg district. Losses were greatest in ratoons. 'Red spot', an overall red freckling appearing on young canes, which died, was associated with a species of *Marasmius* and was also prevalent in the same area.

It is suggested that the causal fungus of the *Sclerospora* disease [*S. macrospora*] should be included in the newly created genus *Sclerophthora* [32, p. 631].

Yellow spot disease (*Cercospora kopkei*) [33, p. 52; 34, p. 184] was serious in the Ingham and Innisfail areas. Droopy top occurred in small areas, apparently associated with nutrient deficiency, though its exact nature is not yet known.

HUGHES (C. G.). **Ratoon stunting disease yield trials.**—*Cane Gr. quart. Bull.*, 18, 3, pp. 71–75, 1955.

Ratoon stunting of sugar cane, first noted in Queensland in ratoons of Q. 28 in 1945 [cf. *R.A.M.*, 28, p. 243 and preceding and following abstracts], was shown by trials completed in 1948 to cause from 11 to 37 per cent. loss in plant crops of this variety. Subsequently trials were started in 1953 with a number of varieties in different areas, which showed that in the plant crop Q. 50 alone showed any degree of resistance, while Pindar, Trojan, and N. Co. 310 suffered an average loss of 14, 23, and 20 per cent. respectively. Figures are given of the six trials and the results of the ratoon crops are awaited.

HUGHES (C. G.). **Some recent developments in the study of ratoon stunting disease.**—*Cane Gr. quart. Bull.*, 19, 1, pp. 27–28, 1955.

The internal colour symptoms of ratoon stunting disease of sugar-cane in Queensland [cf. *R.A.M.*, 33, p. 320], a pale, salmon-pink blush on the immature nodes near the growing point, can be seen in bright light immediately after cutting primary shoots, especially of poorer stools, and may be found when these shoots are still below ground.

HUGHES (C. G.). **Ratoon stunting disease of Sugar-Cane.**—*J. Aust. Inst. agric. Sci.*, 21, 1, pp. 3–9, 2 figs., 1955.

After briefly reviewing the history of ratoon stunting virus disease of sugar-cane [see preceding and next abstracts], the author gives a succinct account in semi-popular terms of its symptoms, mode of transmission, causal agent, and control. In a final section dealing with implications it is stated that because of the losses caused, the disease ranks as the most severe in the sugar-cane industry of the world. There is evidence, also, that it is an important factor in the 'running-out' of varieties.

HUTCHINSON (P. B.). **Ratoon stunting disease of Sugar Cane.**—*Trop. Agriculture Trin.*, 33, 1, pp. 13–17, 1 fig., 1956.

The information in this paper, arising from a visit to Queensland in 1954, has already been noticed from other sources [see preceding abstracts].

KAR (K.), SRIVASTAVA (D. D.), & SINGH (D. R.). **Control of red rot of Sugarcane.**—*Curr. Sci.*, 24, 8, p. 277, 1955.

The midrib lesions on the leaves of sugar-cane affected by red rot [*Glomerella tucumanensis*: *R.A.M.*, 31, p. 87; 35, p. 44] are an important source of infection. In rainy weather spores from the acervuli are washed down into the leaf sheaf where they germinate readily and infect the stem at the node. In spraying experiments conducted by the Main Sugarcane Station, Shahjahanpur, on a number of varieties, dithane and blitox at 2 lb. per 100 gals. water (100 to 150 gals. of spray per acre), applied three times between July and September, showed some promise in checking the occurrence of the midrib lesions and thus controlling the disease.

WIEHE (P. O.). **Diseases.**—*Rep. Sug. Ind. Res. Inst.* (formerly *Rep. Sug. Cane Res. Sta.*), *Mauritius, 1954*, pp. 47–50, 1 fig., 2 graphs, 1955.

It is stated in this report [cf. *R.A.M.*, 33, p. 633] that in Mauritius sugar-cane ratoon stunting [34, p. 818] occurs on M. 134/32, B. 3337, Co. 419, Co. 421, and D. 109. The last mentioned is useful as a 'test variety' in experiments as it clearly shows the nodal colour symptoms characteristic of the disease. There is some indication of a correlation between environment and the severity of the disease.

Chlorotic streak is reported on M. 134/32 and Ebène 1/37, the two most widely cultivated varieties, B. 3337 (the most susceptible), B. 37161, and B. 37172. Hot-water treatment of cane setts [loc. cit.] is recommended for areas where the disease is prevalent. The sucrose content of the plant is not affected, but the number of canes per stool is slightly reduced, the size of individual stalks greatly affected, and the weight of infected stools reduced by over 30 per cent.

RAMAKRISHNAN (T. S.) & SUNDARAM (N. V.). **Additions to the fungi of Madras.—XVI, XVII.**—*Proc. Indian Acad. Sci.*, Sect. B., 40, 1, pp. 17–23, 9 figs., 1954; 41, 5, pp. 189–195, 1 pl., 10 figs., 1955.

The first of these papers [cf. *R.A.M.*, 33, p. 636] deals with nine fungi, six of them described as new species, but none parasitic on hosts of economic importance. The second lists 15 fungi, including four species described as new. *Elsinoe fawcetti* has been found on leaves and fruits of grapefruit and orange, but only in the imperfect state. *Sphaceloma fawcettii*. *Guignardia bidwellii* as pycnidia on vines [C.M.I. map No. 81] is a new record for the State. It causes considerable damage to exotic varieties but less to native grapes.

Mycosphaerella agapanthi-umbellati n.sp. [nom. nov.] occurs on *Agapanthus umbellatus*. This name has been substituted for *M. agapanthi* [30, p. 195], which is already occupied by a different fungus (Lindau, Engler, & Prantl., *Natürl. Pflanzenfam.*, 1 Teil, 1 Abt., 1897, p. 427).

The uredial stage only of *Phakopsora vitis* [*Angiopsora ampelopsidis* (Thirumalachar & Kern. *Mycologia*. 41. p. 288. 1949)] was found in the cold months on vine leaves in Coimbatore. Kallar. and Ketti. affecting blue. but not green grapes. It was also found on *Ampelocissus arnottiana* and *Cissus* sp.

Uredia and telia of *Puccinia iridis*. the former heavily parasitized by *Darluca filum*. were found on leaves of *Iris germanica*. *Cercospora jasminicola* produces reddish-brown. circular or irregular. amphigenous spots on the leaves of *Jasminum grandiflorum* in Coimbatore. spreading rapidly in rainy weather and causing loss of foliage.

Viennot-Bourgin (G.). **Urédinales d'Afrique (4e note). Urédinales de la Côte d'Ivoire (3e note).** [Uredinales of Africa (4th note). Uredinales of the Ivory Coast (3rd note).] — *Bull. Soc. mycol. Fr.*. 70. 4. pp. 410-419. 1954. [Received 1955.]

This further contribution to the series [cf. *R.A.M.*, 33. p. 383] contains descriptions of 14 new species of Uredinales found in the Ivory Coast.

Schmitt (J. A.). **The status of the name Erysiphe cichoracearum DC.** *Mycologia*, 47, 3, pp. 422–424, 1955.

After pointing out that according to Salmon (*Mem. Torrey bot. Cl.*. 9. pp. 1–292. 1900). who. however. did not follow the International Rules. the name of the fungus causing powdery mildew of zinnia. phlox. cucurbits. and other hosts is *Erysiphe cichoracearum* DC. the author refers to W. B. Cooke's view that the valid name of this organism *sensu* Salmon is *E. communis* Wallr. ex Fr. [*R.A.M.*. 32. p. 342]. He adduces evidence from the literature in support of his contention that the name *E. communis* is inapplicable to what Salmon and most other workers call *E. cichoracearum*. Mérat's use of *E. cichoracearum* DC in a work published in 1821 validates the name. which should be cited as *E. cichoracearum* DC ex Mérat [34. p. 108].

Abe (T.) & Kono (M.). **Studies on the white root-rot of Tea bush. II. On the relation between pathogenicities and different conditions of inoculation, as well as on fungal growth in deficient oxygen.** — *Sci. Rep. Fac. Agric. Saikyo Univ.* 6, pp. 153–163, 12 graphs, 1954.

In a further contribution to this series [*R.A.M.*. 34. p. 822] inoculation studies at Saikyo University. Kyoto. Japan. on tea seedlings with three different isolates of *Rosellinia necatrix* [loc. cit.] showed that the white root rot was most severe in spring and summer. less severe in unsterilized soil than sterilized. and in dry soil than wet. The pathogenicity of the isolates was associated with their ability to decompose lignin and was influenced by the optimum pH for hyphal growth in relation to that of the soil. Cultures of *R. necatrix* survived in one tenth of the oxygen content of normal air and continued growth at one third, but did not survive three days without oxygen.

De Jong (P.). **Recent developments in crop protection equipment.** — *Plant. Chron.*, 49, 18, pp. 480–482, 1954.

In his address to the United Planter's Association of Southern India in August. 1954. the author described new equipment which is being considered for the application of copper sprays to control tea blister blight [*Exobasidium vexans*: *R.A.M.*, 34. p. 550]. By fitting a Colibri No. 7 knapsack sprayer with a pressure regulation stabiliser (produced by Cooper Pegler Ltd.) the spraying time was increased by 55 per cent. and the amount of spray fluid applied to tea was reduced. Other machines in possession of the Scientific Department include a new model of the Swingfog Pest Control Unit, originally designed for the application of oil-based insecticides in aerosol form, but now adapted by means of a new pattern regulating valve for

use with wettable sprays, and two types of shoulder mounted mist blower, the Kiekens-Dekker and Mini-Micron. The Urgent Portable Mist Blower used in Ceylon is a much lighter type of machine than the last two and possibly more suitable.

SEGRETAIN (G.) & HIRTH (L.). **Action de substances azotées sur la multiplication du virus de la mosaïque du Tabac en culture de tissus.** [Action of nitrogenous substances on the multiplication of the Tobacco mosaic virus in tissue culture.] —*C. R. Soc. Biol., Paris*, 147, 11–12, pp. 1042–1043. 1953.

Previous experiments having shown that coco-nut milk promotes the multiplication of tobacco mosaic virus cultured in crown gall [*Aphobacterium tumefaciens*] tissue from the same host [*R.A.M.*, 32, p. 219], similar tests were performed at the Institut Pasteur, Paris, incorporating in the medium a number of amino acids occurring for the most part in both the milk and the virus.

After two months' growth significant results were secured only with sap from tissue given aspartic or glutamic acid at a concentration of 0·033 gm. per l., the former reducing the number of lesions produced on five half leaves of *Nicotiana glutinosa* from 86 on the controls inoculated with sap from a tissue culture on a basic medium to 49 in one test and from 129 to 75 in another, whereas the latter increased them from 47 to 126. Confirmation of the last figures was obtained serologically. The dilution end points of two saps from tumours given glutamic acid exceeded 1 in 200 as compared with 1 in 66 and 1 in 100 for the controls.

WEINTRAUB (M.) & KEMP (W. G.). **The inhibiting effect of some heterocyclic and other organic compounds on Tobacco mosaic virus.**—*Canad. J. Microbiol.*, 1, 7, pp. 549–559, 1 pl., 1 graph, 1955.

In this further contribution from the Plant Pathology Laboratory, St. Catharines, Ontario [*R.A.M.*, 32, p. 363], the inhibitory action on tobacco mosaic virus in *Nicotiana glutinosa* leaves of a number of heterocyclic and miscellaneous organic compounds was investigated using the method previously described. A significant reduction in the number of lesions was produced by 2-thiophenecarboxaldehyde thiosemicarbazone (1 : 1,000 and 1 : 5,000), 2-benzoyl thiophene (at all concentrations tested, from 1 : 1,000 to 1 : 10,000), 2-acetyl thiophene, 2-furaldehyde, acetophenone, and 2-furaldoxime (all at 1 : 1,000), and 2-nitrofurane and propiophenone (both 1 : 5,000), all applied before or after inoculation. Measurement of the rate of oxygen consumption led the authors to conclude that these inhibitors acted through the physiology of the host rather than directly on the virus.

BARTELS (W.). **Untersuchungen über die Inaktivierung des Tabakmosaikvirus durch Extrakte und Sekrete von höheren Pflanzen und einigen Mikroorganismen. Ein Beitrag zur Frage der Kompostierung tabakmosaikvirushaltigen Pflanzenmaterials.** [Studies on the inactivation of the Tobacco mosaic virus by extracts and secretions of higher plants and some micro-organisms. A contribution to the question of composting plant material containing Tobacco mosaic virus.]—*Phytopath. Z.*, 25, 1, pp. 72–98, 2 figs.; 2, pp. 113–152, 1955.

The following are some of the most important results of studies at the Institute for Phytopathology and Plant Protection of the University of Rostock, Germany, on the inactivation of tobacco mosaic virus [*R.A.M.*, 35, p. 79] by bacterial and fungal culture filtrates, extracts of green leaves and wilting foliage, and of soil and compost, and the leachings from cultivated plant roots.

Under normal conditions the virus is inactivable by steam sterilization of expressed leaf and root saps at 92° and 84° C., respectively, though in dried leaves survival is still possible between 100° and 150°. The infectivity of the virus may also be reduced in some measure by proper aeration of the compost, a loose structure, and a sufficient moisture content, all of which enhance microbiological

activity and thereby tend to inhibit the virus. Of the organisms tested by the author, *Fusarium oxysporum*, *Trichothecium roseum*, *Thielavia* [*Thielaviopsis*] *basicola*, and *Sclerotinia fructigena* were the most efficient, producing over 90 per cent. inactivation in leaf disks under favourable conditions. Similar results were obtained with extracts from green leaves of *Senecio vulgaris*, *Ornithopus sativus*, *Chenopodium album*, sugar beet, tomato, celery, red cabbage, cherry witches' broom, and Norway maple [*Acer platanoides*], and from wilting foliage of lime [*Tilia*], cherry, and apple, while complete inactivation was secured with black currant and parsley leaf extracts at high concentrations.

In practice it would be necessary to mix the inactivating extracts with the virus-containing plant material in the following minimum proportions: one part of dry foliage and two parts of water, or three parts of green leaves, to one part of fresh infective material, with just enough additional water to moisten. In none of the tests did six weeks' contact with the above-mentioned substances suffice for complete inactivation of the virus in infected tobacco leaves, for which a protracted period of composting is evidently essential. In most of the buffering experiments alkalinity reduced the inactivating property of the foliar extracts and the antagonistic fungi, indicating that only small quantities of lime should be applied to the compost heap. The inactivation of tobacco mosaic virus by these methods was shown by serological tests to be partially reversible, denoting that the molecule is not irreparably damaged and might well regain its infectivity after treatment in the compost heap.

The drainage water from flax, peas (both grown in sand), and wheat (in soil) produced over 90 per cent. inactivation when used at a high concentration (three parts to one part of the virus in sodium chloride extract). Water from peas grown in sand was also effective at a low concentration (one part to one of the virus and two parts of distilled water), and a comparable action was exerted by the water drained from rye grown in soil. As in the tests with fungi and foliar extracts, lengthy contact was essential for inactivation, shorter periods tending rather to enhance the infectiousness of the virus. On the other hand, adjustment of the pH to an alkaline reaction increased the inactivating property of the drainage water instead of reducing it as in the foregoing experiments. The virus molecule did not sustain irreversible damage and remained serologically active.

In none of the tests with compost and soil extracts did the degree of inactivation exceed 65·3 per cent.

It is concluded from these data that steam sterilization of compost containing virus-infected tobacco refuse cannot be dispensed with pending further studies along the present lines. However, a considerable reduction of infectivity may be achieved by rational methods of composting and thorough chopping-up of the debris, which results in a kind of 'self-inactivation'.

BARTELS (W.). **Nicotiana texana hort. als Testpflanze für das Tabakmosaik-Virus.** [*Nicotiana texana* hort. as a test plant for the Tobacco mosaic virus.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., **9**, 4, pp. 75–76, 1 fig., 1955.

Nicotiana texana, a subspecies of *N. rustica*, has proved a very satisfactory indicator plant for tobacco mosaic virus at the Phytopathological Institute, Rostock. Both in the greenhouse and in the laboratory, where the plants were irradiated for 23 hours daily over a three-day period with 600 lux at a constant temperature of 23° C. and a relative humidity of 55 to 60 per cent., *N. texana* developed considerably more lesions than did *N. glutinosa* with an equal concentration of the virus, though they did not appear on the former species until the fourth day after inoculation as compared with the third on the latter. On *N. texana* the lesions are smaller than on *N. glutinosa*, but they stand out sharply from the leaf surface by reason of their dark colour and can be counted easily.

Bercks (R.). **Virusgehalt von Tabakpflanzen bei Mischinfektionen durch Kartoffel-X- und Y-Virus.** [Virus content of Tobacco plants in mixed infections by Potato X- and Y-viruses.]—*Phytopath. Z.*, 24, 4, pp. 407–420, 2 figs., 5 graphs, 1955.

Experiments were carried out at different times of year at the Institute for Virus Serology, Brunswick, Germany, to determine whether the increased damage to Samsun tobacco plants caused by inoculation with a mixture of potato viruses X and Y [cf. *R.A.M.*, 13, p. 462], as compared with either alone, is occasioned by a rise in concentration of one of the viruses. The effects were found to depend on environmental conditions [cf. 34, p. 787], being much more severe in the autumn and winter than in the spring and summer. There was a partial, transitory increase in the concentration of virus X [cf. above, p. 317] in the mixed series as compared with the controls inoculated with that virus alone, but the results of individual tests were variable, and no correlation with the degree of injury could be established. In the case of virus Y no assured differences in reaction could be detected between the plants inoculated with mixed and single viruses.

Müller (Hannelore). **Versuche zur Bekämpfung von Thielavia basicola Zopf.** [Experiments on the control of *Thielavia basicola* Zopf.]—*Z. PflKrankh.*, 62, 4, pp. 193–207, 4 figs., 1 graph, 1955. [English summary.]

At the Plant Protection Institute, Stuttgart-Hohenheim, Germany, in 1952–3, calcium-cyanamide, FK 85, and FK 86 were tested in comparison with formalin and soil steaming for toxicity to *Thielavia* [*Thielaviopsis*] *basicola*, the agent of tobacco root rot [*R.A.M.*, 34, p. 678]. FK 85 and FK 86, supplied by the Lonza-Werke, Weil am Rhein, are still in the experimental stage, and the only information available regarding their composition is that both contain calcium cyanamide with the addition of a fungicide (mercury in the case of FK 86).

In laboratory tests the growth of a strain of the fungus from cyclamen [34, p. 152] was inhibited by the addition to the nutrient agar medium of 0·07 per cent. calcium cyanamide. In greenhouse experiments at a temperature ranging from 12° to 20° C. seeds or well-developed seedlings of the highly susceptible Virgin B variety were planted in pots of soil with a 62 per cent. moisture content, to which different quantities of calcium cyanamide had been added 25 to 30 days previously. The incorporation of the chemical in the top layer of soil at a dosage of 100 gm. per sq. m. reduced damage to seedlings from the pathogen by one half, while applications of calcium cyanamide, FK 85, or FK 86 at a rate of or exceeding 60 gm. gave very satisfactory results on transplants. Almost complete control of seedling root rot was achieved by the thorough admixture of FK 86 with the soil at 3 kg. per cu.m., FK 85 at the same rate being also reasonably effective, whilst calcium cyanamide at 2 kg. reduced the incidence of infection by 50 per cent. FK 86 at 3 kg. was the most efficient of the chemicals on transplanted tobacco in heavily infected soil; the same preparation at 2 and FK 85 and calcium cyanamide at 3 kg. also proved adequate under comparable conditions. The initial improvement in plant growth in the formalin-treated and steam-sterilized soils was not maintained.

Kerr (W. E.). **Handling and testing crop and vegetable seed in S. Rhodesia.**—*Rhod. agric. J.*, 52, 4, pp. 293–301, 1955.

Investigations in Southern Rhodesia demonstrated that the rinsing of tobacco seed after treatment with 1 in 1,000 silver nitrate against *Pseudomonas tabacum* and *P. angulata* [*R.A.M.*, 9, p. 119] is unnecessary. Less damping-off occurred from non-rinsed than from rinsed, treated seed sown in the greenhouse. The addition of an [unspecified] wetter did not affect germination. It is recommended that the seed be treated only in the year of sowing. Since rinsed seed deteriorates in storage at about the same rate as unwashed seed the reduction in viability may be due to moisture uptake during treatment.

Kelman (A.), Lucas (G. B.), & Garriss (H. R.). **False broom rape of Tobacco in North Carolina.**—*J. Elisha Mitchell Sci. Soc.*, 71, 2, pp. 137–174, 1955.

False broomrape, a tobacco disease of unknown origin, is reported to be widespread in North Carolina. White, succulent, irregular outgrowths appear on the roots of affected plants. Sometimes leaf-like structures from the hypertrophied tissues emerge from the soil and develop chlorophyll. The plants become stunted. The disease was successfully transmitted to healthy tobacco plants when their roots were immersed in a suspension of fragments of false broomrape tissue.

Pierson (C. F.), Gothoskar (S. S.), Walker (J. C.), & Stahmann (M. A.). **Histological studies on the role of pectic enzymes in the development of Fusarium wilt symptoms in Tomato.**—*Phytopathology*, 45, 10, pp. 524–527, 1955.

In further studies at the Departments of Plant Pathology and Biochemistry, University of Wisconsin, the development of vascular plugs was followed in Bonny Best tomato cuttings treated with a culture filtrate from *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* containing pectin-methyl-esterase and depolymerase and also in cuttings treated with a commercial enzyme preparation containing pectin-methyl-esterase and polygalacturonase [*R.A.M.*, 35, p. 50]. Ruthenium red was used as a stain for paraffin sections taken from infected plants in the incipient stage of wilt and from treated and untreated cuttings at 12, 24, 36, and 48 hours after the beginning of the experiment. In the treated cuttings vascular plugs formed progressively, starting with small clumps or strands at 12 hours and ending with quasi-complete occlusion at 48. This process was accompanied by the development in the middle lamellae of increasingly large, clear areas. Vascular discoloration was perceptible microscopically at 24 and macroscopically at 48 hours, by which time symptoms were clearly apparent. Diseased plants likewise contained vascular plugs of the same type. On the other hand, those treated with a pectin-methyl-esterase from tobacco showed neither vascular discoloration nor occlusion at the close of 48 hours.

In both infected and treated plants pectic materials in the middle lamellae apparently give rise to structures which plug the vessels, but the role of pectin-methyl-esterase in the disease syndrome is obscure.

Darby (J. F.). **Recent developments in the control of the major diseases of unstaked Tomatoes grown on the sandy soils of South Florida.**—*Proc. Fla hort. Soc.*, 66, pp. 103–107, 6 figs., 1 graph, 1954.

A fungicidal programme is suggested for unstaked tomatoes grown in sandy soils in Southern Florida, where the major foliage diseases are late blight (*Phytophthora infestans*), grey mould (*Botrytis cinerea*), bacterial spot (*Xanthomonas vesicatoria*), grey leaf spot (*Stemphylium solani*), and ghost spot, attributable possibly to *B. cinerea* [*R.A.M.*, 35, p. 50]. The applications should be started on a weekly schedule with either 2 lb. of zineb or 1½ to 2 lb. of manzate per 100 gals. When the plants are 6 to 8 in. high, 2 qt. of nabam plus ¾ lb. of 36 per cent. zinc sulphate (or its equivalent) may be substituted, or used alternately with zineb or manzate. If bacterial spot threatens, a suitable form of copper (copozim, tribasic copper sulphate, copper A, etc.,) used at a rate to include 1½ lb. of metallic copper per 100 gals. may be alternated with one of the above-mentioned materials, provided late blight is not present locally.

The first application of phygon against grey mould should be made shortly before 'laying by' the tomatoes, and another just after. For the next four to six weeks nabam plus zinc sulphate should be alternated with phygon at intervals of five days. At least six applications of phygon seem to be necessary. After this, if neither late blight nor grey spot is present in the area, applications may be made

at intervals of one week. On mature plants a minimum of 250 to 300 gals. of spray per acre is necessary to give adequate coverage.

Mohanty (U. N.) & Mohanty (N. N.). **Cercospora leaf mould of Tomato.**—*Sci. & Cult.*, 21, 5, pp. 269–270, 2 figs., 1955.

Cercospora leaf spot of tomato, *C. fuligena* [*R.A.M.*, 35, p. 52], was severe in 1955 on some native varieties grown from local seed, from which it spread to Red Ball and Marglobe at the State Agricultural Research Station, Bhubaneswar, Orissa, India.

Krotova (Mme O. A.) & Malenkina (Mme T. A.). Действие фитонцидов Лука на снижение заболеваний Помидоров. [The effect of Onion phytoncides on disease reduction in Tomatoes.]—Сад и Огород [*Orchard & Garden*], *1955*, 7, pp. 77–78, 1955.

The climatic conditions of Sakhalin, U.S.S.R., are favourable to the development of tomato diseases. Usually starting from the second week in August 70 to 80 per cent. of the plants become infected with *Phytophthora* [*infestans*: *R.A.M.*, 7, p. 283] and 50 per cent. with *Macrosporium* [*Alternaria solani*: cf. 15, p. 26]. So far, none of the known control measures has been effective. In experiments in 1951 and 1952 fruit diseases were reduced from between 50 and 83 per cent. in the untreated to 39 to 64 per cent. in tomatoes dipped before storage for two minutes in onion juice and to 36 to 66 per cent. when an onion juice solution in water (1:100) was used [cf. 31, p. 608]. All the treated tomatoes were free from *P. infestans*, which affected 22 to 24 per cent. of the untreated.

Marinković (P. R.). **Prilog poznavanju parazitne flore na šumskom drveću planine Stolova.** [A contribution to the knowledge of the parasitic flora on forest trees of the Stolovi mountain.]—Гласн. шумарског Фак. [*Bull. for. Fac. Beograd*], *1954*, 7, pp. 303–306, 1954. [French summary.]

During the summer of 1953 a survey was made of the parasitic flora on forest trees at the foot of the Stolovi mountain in Serbia, Yugoslavia. Included among the 48 species of fungi recorded are *Fomes fomentarius* [*R.A.M.*, 30, p. 439], affecting 25 to 50 per cent. of the trees, *Polystictus hirsutus* and *Trametes gibbosa* [cf. 30, p. 390], and also *Schizophyllum commune* [33, p. 325] on beech, *Polyporus sulphureus* [cf. 34, p. 411], *P. dryophilus* [cf. 9, p. 749], and *F. igniarius* [cf. 15, p. 63], all serious on oak, and *F. fulvus* presenting a serious threat to plums [35, p. 91].

Bourchier (R. J.). **New host relationships for fungus parasites of the Lodgepole Pine Mistletoe.**—*Bi.-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 11, 4, p. 2, 1955.

The first occurrence of *Wallrothiella arceuthobii* [*R.A.M.*, 32, p. 520] on dwarf mistletoe (*Arceuthobium americanum*) parasitizing white spruce (*Picea glauca*) is recorded. In the same year, 1954, *Septogloeum gillii* was found for the first time on *A. americanum* parasitic on jack pine (*Pinus banksiana*) in Alberta, several hundred miles east of all previous collections of this fungus.

Ahlgren (C. E.). **Grafted selections of eastern white Pine tested for resistance to blister rust.**—*J. For.*, 53, 10, pp. 727–729, 1955.

The results of six years of observation on blister rust (*Cronartium ribicola*) resistance in eastern white pine [*Pinus strobus*: cf. *R.A.M.*, 32, p. 525] showed that the graft selections planted in 1949 on a rust-infected island in Basswood Lake, Minnesota, were highly resistant, 5 per cent. only becoming infected as against 58 per cent. infection on the control seedlings. The growth rate, however, was poorer in the grafted selections, there was a considerable incidence of an undesirable prostrate form, and the mortality due to causes other than blister blight was higher.

Anderson (R. L.) & French (D. W.). **Evidence of races of Cronartium ribicola on Ribes.**—*For. Sci.*, 1, 1, pp. 38–39, 1 fig., 1955.

Tests carried out conjointly by Lake States Forest Experiment Station, United States Department of Agriculture, and the University of Minnesota Agricultural Experiment Station, revealed the existence of more than one race of *Cronartium ribicola* on *Ribes* [*R.A.M.*, 34, pp. 4, 758]. In 1953, using *R. hirtellum* as a differential host, a chlorotic and a necrotic type of reaction were produced by spores collected from *Pinus strobus* and *P. lambertiana*, respectively. In 1954 four aecidiospore collections from *P. lambertiana* produced large, necrotic patches surrounded by a chlorotic zone, while five collections from *P. strobus* and one from *P. monticola* caused large chlorotic spots with no necrosis. Spores from other *Ribes* species and hybrids do not induce differential reactions. Viking and *R. viburnifolium* were not infected by any spore collections.

Igmándy (Z.). **A fenyőtapló (Trametes pini (Thore) Fries) előfordulása és károsítása hazankban.** [The occurrence and severity of *Trametes pini* (Thore) Fries in Hungary.]—*Mitt. berg- u. hüttmänn. Abt. Univ. Sopron, 1954*, pp. 5–10, 1955. [Russian and German summaries. Abs. in *For. Abstr.*, 16, 4, p. 529, 1955.]

In Hungary [*R.A.M.*, 25, p. 481] the typical form of *Trametes* [*Fomes*] *pini* occurs in the western Carpathians on Scots pine [cf. 32, p. 44], while *F. pini* var. *abietis* is present on the eastern side chiefly on Norway spruce. The typical form has been observed sporadically as far west as Sopron but in the natural pine stands of the Bakony Forest incidence is high; in one 100-year-old stand 16·5 per cent. of the trees are affected.

Příhoda (A.). **Sypavka Modřínu, způsobená houbou Meria laricis Vuill.** [Larch needle-cast caused by the fungus *Meria laricis* Vuill.]—*Lesn. Práce*, 33, 8, pp. 364–368, 4 figs., 1954. [Received 1955.]

Meria laricis was recorded on one- and two-year-old larch seedlings [cf. *R.A.M.*, 31, p. 91] in three places in Czechoslovakia in July, 1953. A description of the fungus is given.

Salisbury (P. J.). **Parasitism of Phytophthora spp. isolated from root rots of Port Orford Cedar in British Columbia.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 11, 5, pp. 3–4, 1955.

Four species of *Phytophthora* associated with root rot of Port Orford cedar [*Chamaecyparis lawsoniana*] have been isolated in British Columbian nurseries, two being unknown and the others identified as *P. cinnamomi* and *P. lateralis* [*R.A.M.*, 34, p. 433]. Losses were heaviest in soils infected with *P. lateralis*. Infection of the fibrous roots of English yew (*Taxus baccata*) by *P. cinnamomi* [34, p. 4] in British Columbia resulted in yellowing of the foliage, less serious damage than that observed in Oregon. Inoculation of yew stems with the four *Phytophthora* species failed to produce any permanent infection.

The spread of *P. lateralis* in *C. lawsoniana* nurseries was shown to follow rapidly the direction of flow of surface water, more slowly that of ground water, and also to accompany the transport of soil particles by workers.

To date these four species of *Phytophthora* have only been found in nurseries and plantings in British Columbia, and no deduction can yet be made as to whether *P. cinnamomi* could become established in natural tree stands [cf. 24, p. 295].

Kaufert (F. H.) & Cummings (W. H.). **Forestry and related research in North America.**—viii + 280 pp., Monumental Printing Company, Baltimore, Maryland, 1955.

This book deals with timber resources, products, and utilization in the United

States and Canada, and a short section is devoted to Mexico. Special attention is given to future forest policy and research, including forest pathology in the United States (pp. 150–159), and Canada (pp. 234–236), and to timber preservation in Canada (p. 247).

Spilker (O. W.) & Young (H. C.). **Longevity of Endoconidiophora fagacearum in lumber.**—*Plant Dis. Reptr*, 39, 5, pp. 429–432, 1 fig., 1955. [Multilithed.]

In view of the threatened foreign embargoes on shipments and interruptions in the normal distribution of oak lumber in the United States because of the danger of spreading *Endoconidiophora fagacearum* [*Chalara quercina*], the longevity of the fungus [*R.A.M.*, 34, p. 114] in blocks retaining bark was studied by the Division of Plant Industry, Ohio Department of Agriculture, and the Department of Botany and Plant Pathology, Ohio Agricultural Experiment Station. Survival was three to five weeks at 25° to 27·5° C., compared with at least 12 weeks at 5°, and decreased with reduced moisture content. Lumber salvaged from diseased trees and stacked during the summer months should, therefore, be safe for use. That cut from diseased trees in the winter may serve as a source of inoculum unless the bark is removed, or the lumber stored for six to nine months or kiln dried. Since the survival period of the fungus in the slab material removed from diseased trees during lumbering is unknown, such material should be burnt.

Englerth (G. H.) & Scheffer (T. C.). **Tests of decay resistance of four western pole species.**—*J. For.*, 53, 8, pp. 556–561, 1 fig., 1 graph, 1955.

In tests by the Central States Forest Experiment Station and Forest Products Laboratory, United States Department of Agriculture, samples of western red cedar [*Thuja plicata*], western larch [*Larix occidentalis*], Douglas fir [*Pseudotsuga taxifolia*], and lodgepole pine [*Pinus contorta*] from the inner and outer heartwood, were buried in soil at 6 in. depth for four years, and also exposed to direct attack in the laboratory by *Fomes roseus*, *Lentinus lepideus*, *Lenzites trabea*, *Poria incrassata*, *P. monticola*, and *P. xantha* for three months at 80° F. and 70 per cent. relative humidity, the test blocks being placed on others already overgrown with the fungus.

The results indicated that, in general, the heartwood of western red cedar is resistant to decay in the lower and middle thirds of the pole and moderately so in the upper third, while that of the other three woods was moderately resistant at all heights. Differences in the resistance of western red cedar and to a lesser extent of western larch were observed in the outer and the inner heartwoods, the former being more resistant. Decay resistance was plainly correlated with the specific gravity of the wood in western larch, but not in the others. Internal sapwood was no more resistant than normal sapwood, so that the interior decay resistance of a pole with internal sapwood would be less than that of one without it.

Bavendamm (W.) & Ehlers (W.). **Beiträge zur Holzschutztechnik.—Erste Mitteilung. Praxisnahe Untersuchungen über die Imprägnierung von Bauholz durch Streichen und Spritzen.** [Contributions to wood protection technique.—First communication. Semi-practical investigations on the impregnation of structural timber by painting and spraying.]—*Holz a. Roh- u. Werkst.*, 12, 5, pp. 183–185, 1954.

In brushing and spraying experiments at the Forestry Research Institute, Reinbek, near Hamburg, Germany, pine wood roof laths with a rough-sawn upper surface, treated in a vertical position, absorbed on an average some 50 per cent. more preservative material (salts and oils) than spruce. The maximum decrease in the quantities absorbed in an inclined position (45° to 90°) was about 40 per cent. of that in the upright, and 60 per cent. in planed as compared with rough laths.

The depths of penetration were found to be much slighter and the losses of preservative, especially in spraying, a great deal heavier than was anticipated. The use of slightly soluble salts for the treatment of roof laths is considered to be uneconomic.

Pěstování Borových porostů. [Cultivation of Pine stands.]—*Lesn. Knihovna, 1952*, 17, 191 pp., 46 figs., 3 diags., 1952. [Received 1955].

This entire number is devoted to the cultivation of pine (*Pinus sylvestris*) in Czechoslovakia and is divided into 11 parts. In part 10 (pp. 176–183) A. Kalandra briefly discusses various diseases, the damage they cause, and their control.

Ullrich (J.). **Schwarzringfleckigkeit des Kohls in Deutschland.** [Black ring spot of Cabbage in Germany.]—*NachrBl. dtsch. PflSchDienst (Braunschw.), Stuttgart*, 7, 10, pp. 164–165, 3 figs., 1955.

From samples of cabbage leaves showing black, necrotic spots in the Stuttgart area in the autumn of 1954, sap inoculations were made on several test plants at the Institute for Vegetable Cultivation and Weed Research, Neuss-Lauvenburg. Despite the absence of the typical ring spots the virus was established as cabbage black ring spot virus [cf. *R.A.M.*, 30, p. 8; 33, p. 192]. This atypical syndrome has been observed locally for the past three years; in some places incidence is reported to be heavy. The main sources of infection are probably the seed crops, which should be isolated.

Frandsen (N. O.). **Untersuchungen über Cercospora beticola. III. Morphologie des Pilzes. IV. Die Konidienkeimung.** [Studies on *Cercospora beticola*. III. Morphology of the fungus. IV. Conidial germination.] *Zucker*, 8, 23, pp. 513–516, 6 figs., 1 graph, 1955; 9, 1, pp. 3–5, 3 figs., 1956.

The sporodochia of *Cercospora beticola* [*R.A.M.*, 35, p. 61] are produced on the leaves, petioles, stems, and perianths of sugar beet and are the sole overwintering organs of the pathogen under natural conditions in Germany, persisting in the field on decayed plant refuse, remnants of fodder, seed-bearer stecklings, and seed-clusters. They give rise to fascicles of one or two to over 20 squarrose conidiophores (average 10·85). Counts of the numbers of fascicles on a few spots on the same leaf showed that they occupied only 30 to 40 per cent. of the stomata in fully developed lesions and not more than 15 to 20 per cent. in smaller ones. As a rule only the apical cell of the conidiophore is divided by a transverse septum. The average dimensions of this cell, which is often pale yellow near the tip, are $42{\cdot}4 \pm 1{\cdot}5$ by $4{\cdot}6 \pm 0{\cdot}4\ \mu$. The conidiophores are mostly simple. Out of 1,000 measured an average of only 1·1 per cent. were branched in the samples under observation. The average number of scars per conidiophore was 3·76. The so-called 'septa' of the conidia were found to be optical illusions and are designated 'pseudosepta'. Viewed in the dark field of the microscope or stained with picric acid after treatment with alkali, several naked protoplasts enveloped in a common conidial integument can be detected. In this respect the conidial structure of *C. beticola* resembles that of *Septoria apii-graveolentis* [21, p. 427]. The conidia of the former species arise from originally uninuclear primordia through a more or less synchronous nuclear division, a process that is statistically reflected in the septation and conidial length. The average lengths of the conidia in two spots on leaves inoculated with a monospore line were (A) $79{\cdot}7 \pm 1{\cdot}62$ and (B) $101{\cdot}3 \pm 1{\cdot}91\ \mu$. The number of 'septa' in each of 1,000 conidia from a single leaf ranged from three to 22.

The optimum temperature for conidial germination ranged from 23° to 27° C., while the lower and upper limits were 7° and 36°, respectively. At 97 to 100 per cent. relative humidity all the conidia germinated, at 96 per cent. only 59·3 per cent., and at 95 per cent. none. No germination occurred in distilled water containing 0·025 to 0·05 per cent. copper sulphate.

The average number of germ-tubes produced by each of 100 conidia after 16 hours in water at 20° was 2·84±0·05, with a range of 1 to 7. The process was initiated predominantly at the basal cell and the frequency of germ-tube emission diminished from the suprabasal to the subapical cells.

Bakermans (W. A. P.) & Mooi (J. C.). **Toevoeging van conserbeta of van grond tegen kuilrot bij Voederbieten.** [Application of conserbeta or of soil against clamp rot in Fodder Beets.]—*Landbouwvoorlichting*, 12, 11, pp. 493–499, 1 fig., 1955.

Trials were undertaken in Holland in 1952–3, 1953–4, and 1954–5 to compare the efficiency of conserbeta (a powder containing tetrachloronitrobenzene [tecnazene] as its active ingredient) and soil in the preservation of fodder beets against clamp rot, the agents of which include *Botrytis cinerea*, *Phoma betae*, *Fusarium* spp., and *Helicobasidium purpureum* [*R.A.M.*, 29, p. 495].

The use of conserbeta at 2·5 kg. per ton beets generally resulted in a considerable reduction of rotting, which should not be less than 10 per cent. if the treatment is to be profitable. Other advantages are complete prevention of the spread of *H. purpureum* and marked reduction in sprouting and root production, thereby saving much labour in cleansing the beets on removal from the clamp and probably contributing to the extermination of the aphids concerned in the dissemination of the yellows virus. Beets treated with conserbeta are liable to freeze, a point to be remembered when uncovering the clamps.

Covering with soil is regarded as inapplicable in practice for the following reasons. At a moderately high temperature the beets tend to ferment, the spread of *H. purpureum* is unrestrained, and extensive rooting adds to the labour of cleansing. These drawbacks may, however, be largely counteracted by the use of red or white sand.

Schneider (C. L.). **Incidence of curly top of Sugar Beets in Minnesota and Iowa in 1954.**—*Plant Dis. Reptr*, 39, 6, pp. 453–454, 1955. [Multilithed.]

Sugar beet curly top virus [*R.A.M.*, 35. p. 139] was again in evidence in 1954 in commercial fields in six counties in southern Minnesota and one in northern Iowa. Experimental plots in Ramsey and Waseca counties, Minnesota, were also affected. Of the 15,000 plants examined at the Southern Experimental Station, Waseca, 52 had definite symptoms.

Baumann (G.). **Untersuchungen zur Biologie von Mycosphaerella pinodes (Berk. et Blox.) Stone.** [Studies on the biology of *Mycosphaerella pinodes* (Berk. & Blox.) Stone.]—*Kühn-Arch.*, 67, pp. 305–383, 1953. [Abs. in *Z. PflKrankh.*, 62, 4, pp. 254–255, 1955.]

The perithecia of *Mycosphaerella pinodes*, an agent (together with *Ascochyta pisi* and *A. pinodella*) of foot rot and leaf and pod spot of peas, comparatively uncommon in Germany [*R.A.M.*, 34, p. 337], develop readily on sterile legume stems. Their homothallic character was confirmed by mono-ascospore cultures. The minimum, optimum, and maximum temperatures for mycelial growth were below 5°, 23° to 24°, and above 35° C., respectively, the corresponding levels for sporulation being 8°, 25°, and 36°, respectively. The spores were killed by ten minutes' exposure to a temperature of 76° or one hour at 60°; they sustained no damage from several weeks' maintenance at 13°. The most easily assimilable sources of carbon are maltose, sucrose, and lactose; pycnidial production is stimulated by cellulose. Ammonium and nitrate salts serve equally well as sources of nitrogen, but the concomitant acidification of the medium is injurious to the fungus, the optimum pH for which is near neutrality. Cultures of *M. pinodes* weakened by keeping in darkness secrete toxic products which act on peas similarly to patulin on tomato [27, p. 453], heavy metals intensifying their effects.

M. pinodes is a perthophyte [9, p. 47], but as a rule the middle lamellae of the cell walls are not attacked. The optimum soil temperature for the development of foot rot is between 6° and 8°. The formation of pycnidia and perithecia on the host is accelerated at high and low temperatures (down to 17·5°). The ascospores are released only in the presence of water drops, and a relative humidity of at least 90 per cent. is essential for germination. The inoculation of broad bean, vetch, lupins, and maize resulted in foot rot and that of broad bean and *Lathyrus clymenum* in shoot infection. In general, field peas were more susceptible than the garden varieties to foot rot; resistance to shoot infection was not observed.

The pathogenicity of *M. pinodes* was not impaired by a year's composting, but the fungus cannot grow through the soil and requires immediate contact with the plant to produce infection. Excellent control of foot rot was secured by seed treatment with a hormone preparation supplied by Fahlberg-List, Magdeburg, which totally eliminated infection and stimulated shoot and root growth, but neither copper nor sulphur sprays were effective against stem, leaf, and pod spot.

Brien (R. M.), Chamberlain (E. E.), Cottier (W.), Cruickshank (I. A. M.), Dye (D. W.), Jacks (H.), & Reid (W. D.). **Diseases and pests of Peas and Beans in New Zealand and their control.**—*Bull. Dep. sci. industr. Res. N.Z.* 114, 91 pp., 73 figs., 1955.

This well-illustrated bulletin deals with the fungus, bacterial, and virus diseases of garden and field peas (pp. 10–32), dwarf and runner beans (*Phaseolus vulgaris* and *P. coccineus*, pp. 34–49, the physiological diseases of which are also covered on pp. 50–52), and broad beans (pp. 69–72). The latter part of the bulletin is devoted to plant therapeutants, their use, and their certification [cf. *R.A.M.*, 33, p. 740]. Useful tables cover concentrations of seed dusts (p. 13), fungicides for peas and beans (pp. 22–23), and a spray compatibility chart (p. 68).

Bremer (H.). **Fungizidbehandlung der Brennflecken bei Bohnen.** [Fungicidal control of Bean anthracnose.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 7, 8, pp. 129–131, 2 figs., 1955.

Experiments at the Federal Biological Institute, Neuss-Lauvenburg, Germany, on the control of bean [*Phaseolus vulgaris*] anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, 34, p. 506] with zineb and captan resulted in a promising difference in the number of healthy pods on plants grown from treated and untreated seed. Two unnamed German chemicals gave similar results.

Investigations by the Colonial Pool of Plant Pathologists.—*Commonw. phytopath. News*, 1, 4, pp. 54–56, 1955.

Since 1933, and possibly earlier, an obscure root rot of broad beans in Cyprus has caused severe annual losses, which in 1952 were estimated at £10,000. The first symptoms are usually a yellowing of the basal leaves, which are often dead by the time the uppermost ones become affected; eventually the whole plant dies. Occasionally the root nodules are attacked before the roots themselves, causing the whole plant to turn bright yellow very rapidly and die before the onset of the typical symptoms in the rest of the crop. Typically, infection starts in the collar, tap-root, or laterals, progressing downwards and usually causing an orange-red discoloration of the vascular cylinder. Occasionally a dark brown lesion spreads a short way up the stem. Patches of yellowing plants in affected crops gradually enlarge until the whole field is involved.

The principal pathogen isolated was considered to be a race of *Fusarium oxysporum* f. *pisi*, with *F.o.* var. *redolens* as a secondary parasite. *Macrophomina phaseoli*, *Corticium solani*, and *F. solani* were occasionally associated with *F. oxysporum*. The pathogen is believed to be disseminated by infected soil or plant

debris rather than on the seed and was shown to survive in the soil during a six months' drought. The broad bean varieties Seville Claudia and Seville Aquadulce were less susceptible to root rot than the locally cultivated Seville Ordinary.

Page (O. T.). **Botrytis leaf spot on Onions and its control.**—*Canad. J. agric. Sci.*, 35, 4, pp. 358–365, 1955.

Most of this information on the occurrence of *Botrytis squamosa* on Yellow Globe onions in Ontario has already been noticed from another source [*R.A.M.*, 33, p. 200]. This disease and downy mildew (*Peronospora destructor*) [28, p. 444] were successfully controlled in the field by foliar sprays of manzate (2 lb. per acre), parzate (zineb, 1·5), vancide F–995 W (2·5), and orthocide 50 W [containing captan] (3) [35, p. 66].

Stubbs (L. L.). **Strains of Myzus persicae (Sulz.) active and inactive with respect to virus transmission.**—*Aust. J. biol. Sci.*, 8, 1, pp. 68–74, 1955.

Inconsistent transmission of a persistent yellows virus disease of spinach (frequently associated with a strain of cucumber mosaic virus) by its vector, *Myzus persicae*, having been noted over a period of two years, a study was made at the Department of Agriculture, Burnley, Victoria, of the infective ability of viviparously produced progeny of individual apterae selected at random from a stock colony. It was found that individual cultures varied in their ability to transmit the virus and that selected cultures retained this characteristic. The results indicated that *M. persicae* is heterozygous for ability to transmit the virus.

Inactive insects may, possibly, be in a minority where an efficient virus-vector relationship has been established, and yet predominate where a less efficient relationship exists. It is conceivable that experiments with a vector population established unknowingly from a single individual with a low infective capacity might produce uniformly misleading results in relation to a specific virus. Conversely, work with a mixed population might introduce a greater variable than the sum total of variables eliminated by refined techniques.

Menzies (J. D.). **A Penicillium crown rot of Asparagus.**—*Phytopathology*, 45, 10, pp. 527–530, 1 fig., 1955.

A hitherto unreported crown and root rot of overwintering asparagus plants has become prevalent during the last ten years in the Yakima Valley, Washington, where only one out of 17 seedling nurseries was free from the disease in a survey during the spring of 1947, the incidence in the remainder ranging from 1 to 47 and averaging 17 per cent. The causal organism, *Penicillium martensii*, a member of the same series as *P. cyclopium*, appears to be widely distributed both in the older irrigated areas and in uncultivated land. Ingress to the crown is usually effected through the dormant crown buds and adjacent storage roots, the decayed area frequently extending from the thin edge of the crown into the younger tissues as a dry pocket rot, red to orange at first, later changing to grey and becoming hollow. Invaded roots assume a dull, brown appearance and the cortical cells separate into a disintegrating mealy mass. A reddish streaking of the central stele, mostly of limited extent, commonly accompanies the cortical rot. The same symptom is characteristic of the asparagus rot caused by *Fusarium oxysporum* [*R.A.M.*, 21, p. 236], which does not, however, produce cortical decay. The rot due to *P. martensii* is readily recognizable by the typical bright blue masses of mycelium and spores developing on the diseased tissue.

The results of inoculation experiments yielded conclusive evidence that the fungus is a wound parasite, and freezing injury, such as that induced artificially by upwards of 7½ hours' exposure to a temperature of 5° F., was shown to be a predisposing factor in its occurrence. Control should be based on the hilling of plants

in the autumn to prevent damage from this source, roguing of diseased material at transplanting time, and care in the handling of transplants to avoid unnecessary injury. Fungicidal treatment at this period proved ineffectual.

Hemingway (J. S.). **The prevalence of two species of Cercospora on Groundnuts.**—*Trans. Brit. mycol. Soc.*, 38, 3, pp. 243–246, 2 graphs, 1955.

Studies of the prevalence of *Cercospora* leaf spots of groundnuts at Nachingwea, Tanganyika [*R.A.M.*, 34, p. 74], on the variety Natal Common in 1953, and Kanyoma and Mwitunde in 1954, disclosed that although *C. personata* appeared later in the season its rate of build-up was so much more rapid than that of *C. arachidicola* that it became the major factor in a severe epidemic.

De Carvalho (T.) & Mendes (O.). **A mancha castanha e a mancha preta do Amendoim (Arachis hypogaea L.).** [The chestnut spot and the black spot of Groundnut (*Arachis hypogaea L.*).]—*Bol. Soc. broteriana*, Ser. 2, 27, pp. 155–162, 7 pl., 1953.

The leaf spots of groundnut caused by *Cercospora personata* [C.M.I. map No. 152] and *C. arachidicola* [No. 166; cf. *R.A.M.*, 29, p. 408] are of general occurrence and the most destructive disease of the crop in Mozambique. In the spring of 1952–3 their incidence reached an exceptionally high level as a consequence of the abnormally heavy rainfall. Both stems and leaves of the Java, Maniemba, Spanish, and Virginia varieties were severely attacked, whereas Barberton, Calandhi, Desconhecido [unknown] Nos. 1 and 3, Fumo [Tobacco], Improved Spanish, Macuni, Migongo, Red Spanish, Virginia F, Virginia Jumbo, Wenitunde, and Xinavane No. 1 were virtually immune.

Preventive measures against the leaf spots should include early sowing, crop rotation of at least four years, disinfection (preferably with an organic mercurial) of seed of distant provenance, and burning or burying *in situ* severely diseased plants to obviate the risk of further spread. The results of local experiments on spraying with sulphur were promising but not fully conclusive and further trials are planned.

Greensill (T. M.). **The application of commercial methods of vegetable growing in the eastern region of Nigeria.**—*Trop. Agriculture, Trin.*, 33, 1, pp. 18–34, 1956.

References to plant disease in this paper include the information that *Cladosporium* [? *fulvum*] leaf mould is the most serious disease of tomatoes in Eastern Nigeria, and that blossom-end rot affects this crop on soils with low availability of calcium, the otherwise promising variety Moneymaker being very susceptible.

Mildew [not specified] is a limiting factor in cucumber cultivation. A wilt of tomato and eggplant, believed due to an [unspecified] *Fusarium*, is serious at Enugu. Virus diseases [unspecified] are of considerable importance on beans [*Phaseolus vulgaris*] and tomatoes, and also affect [chilli] peppers [see next abstract]. Market-gardens are also subject to complex mineral disorders.

Dale (W. T.). **Virus diseases of Solanaceous crops in Trinidad.**—*Trop. Agriculture, Trin.*, 33, 1, pp. 35–50, 3 figs., 1956.

Some of the information in this paper, which contains a full account of tobacco mosaic virus, cucumber mosaic virus, [chilli] pepper vein-banding virus, and eggplant mosaic virus as they occur in Trinidad, has already been noticed from another source [*R.A.M.*, 34, p. 278]. Only cucumber mosaic virus was found on natural hosts other than Solanaceae; these included *Commelina* spp. and *Alternanthera ficoidea*. Twisted-leaf virus of tomato [30, p. 450] is also widespread in Trinidad. It is not sap-transmissible, but was readily transmitted by grafting. Its vectors are still unknown. No other hosts are known, and it did not prove transmissible to sweet pepper [cf. loc. cit.].

Aphis gossypii transmits cucumber mosaic. Flea-beetles (*Epitrix* sp.), are the only known vectors of eggplant mosaic virus. The latter disease causes little or no harm to its hosts. The sweet pepper variety Puerto Rico Wonder showed higher resistance to chilli vein-banding mosaic than Fordhook or California.

The condition known as 'tomato bronze leaf' [cf. loc. cit.] was shown to be due to mites and controllable by sulphur dusting. Mites were also responsible for other virus-like symptoms noted on Solanaceae in the greenhouse.

Conroy (R. J.). **Disease threatens Rockmelons.**—*Agric. Gaz. N.S.W.*, 66, 9, p. 459, 1955.

A wilt of rock melons due to a species of *Fusarium* is reported from Brookvale, New South Wales. The disease is similar to that occurring in North America [cf. *R.A.M.*, 34, pp. 10–11, 630] and affects all the local varieties of rock melon, but not other cucurbits.

Morschel (J. R.). **Incidence of molybdenum deficiency in Rockmelons on Murrumbidgee irrigation areas.** *Agric. Gaz. N.S.W.*, 66, 9, pp. 481, 489, 1955.

Rock melons growing on neutral or acid soils in the Murrumbidgee irrigation area and showing chlorotic leaves and scalded leaf margins were found to be suffering from deficiency of molybdenum [*R.A.M.*, 34, p. 318]. A solution of 1 oz. of sodium molybdate in 10 gals. of water, applied at 0·25 pints per plant, restored normal growth.

Blumer (S.), Stalder (L.), & Harder (A.). **Über die gegenseitigen Beziehungen zwischen Gurkenmosaik und Gurkenmehltau (Vorläufige Mitteilung).** [On the mutual relations between Cucumber mosaic and Cucumber mildew (preliminary communication).]—*Phytopath. Z.*, 25, 1, pp. 39–54, 1 fig., 3 graphs, 1955. [English summary.]

The studies herein reported from the Wädenswil Research Institute, Zürich, Switzerland, were undertaken to elucidate the problem of antagonism between cucumber mildew (*Erysiphe polyphaga*) [*E. cichoracearum*: *R.A.M.*, 32, p. 215] and cucumber mosaic virus, which interfered in experiments with the virus.

It was observed that under natural conditions virus symptoms on mildewed plants are relatively mild, while the healthy portions of mosaic-diseased leaves are more susceptible to mildew than those bearing lesions. The incidence of systemic mosaic infection is markedly reduced or at least considerably retarded on mildew-diseased cucumber plants subsequently inoculated with the virus. The inhibition of virus infection (which was also produced by conidial suspensions *in vivo*) is tentatively attributed to direct inactivation of the virus by certain metabolic products of the fungus.

Turian (G.) & Staehelin (M.). **Essais de lutte chimique contre les spores du champignon du coître de la Vigne dans le sol (Coniella diplodiella (Speg.) Pet. et Syd.).** [Experiments on the chemical control of the spores of the white rot fungus of the Vine in the soil (*Coniella diplodiella* (Speg.) Pet. & Syd.).]—*Annu. agric. Suisse*, (69), N.S., 4, 7, pp. 799–808, 1 diag., 1 graph, 1955. [German, English, and Italian summaries.]

The results of laboratory tests at the Federal Agricultural Experiment Station, Lausanne, confirmed previous observations as to the powerful fungicidal action of thiram at concentrations exceeding 0·00001 M on *Coniella* [*Coniothyrium*] *diplodiella* [*R.A.M.*, 34, p. 276]. In the greenhouse the minimum concentration of tersan for effective control was fixed at 1 gm. per kg. soil; at this strength the compound does not appear to influence the autotrophic soil microflora, especially *Azotobacter*. Treatment of the soil in an experimental vineyard with a mixture of

25 per cent. each of tersan and sulphur and 50 per cent. calcium carbonate at the rate of 4 kg. per are [= 119·6046 sq. yds.] completely destroyed the spores of the fungus in the surface layer.

Kornilova (Mme V. N.). Резервное опрыскивание в борьбе с мильдью Винограда. [Reserved spraying in the control of vineyard mildew.]—Сад и Огород [*Orchard & Garden*], *1955*, 7, pp. 75–76, 1955.

A new and more economical plan for treating vines with Bordeaux mixture against mildew [*Uncinula necator* and *Plasmopara viticola*: *R.A.M.*, 33, p. 10] is proposed by the Department of Plant Protection, Daghestan Vine-Vegetable Experiment Station, U.S.S.R. Two to four (preferably three) sprays are usually sufficient, but in wet years a fifth may be required. The first treatment (2 per cent. Bordeaux mixture at 600 l. per ha.) is given just before the appearance of the disease, towards the end of the incubation period, the others following at 8- to 10-day intervals, 1 per cent. Bordeaux mixture at 800 to 1,000 l. per ha. being used for the second and up to 600 to 800 l. per ha. for the third and subsequent sprays. The same periods are recommended for spraying from an aeroplane, the Bordeaux concentration being increased to 6 per cent. for the first and 3 per cent. for the subsequent sprays. Thus, for three sprays, 34 kg. or 2,200 l. Bordeaux mixture per ha. are needed, as against 41 kg. or 4,100 l. previously required.

Smith (K. M.) & Lauffer (M. A.). **Advances in virus research. Volume III.**—ix +339 pp., 34 figs., 51 diags., 13 graphs, New York, Academic Press Inc., 1955. 54*s*.

Among the seven contributions to the third volume of this series [cf. *R.A.M.*, 34, p. 514] that dealing with the multiplication of plant viruses in insect vectors, by K. Maramorosch (pp. 221–250), and that on cross-protection between strains of yellows-type viruses, by L. O. Kunkel (pp. 251–274), are more particularly of phytopathological interest. Each is followed by an extensive bibliography.

Crowley (N. C.). **The effect of seed extracts on the infectivity of plant viruses and its bearing on seed transmission.**—*Aust. J. biol. Sci.*, 8, 1, pp. 56–67, 4 graphs, 1955.

In studies at the Waite Agricultural Research Institute, Adelaide, to determine whether inhibitors or inactivators of plant viruses are present in the seeds of the host [cf. *R.A.M.*, 20, p. 279; 31, p. 635] and, if so, to ascertain the nature of their action, it was found that there is some water-soluble constituent in seeds which can greatly diminish the number of lesions produced by the viruses of cucumber mosaic and tobacco mosaic on cowpea and *Nicotiana glutinosa*, respectively. The following experimental evidence showed conclusively that the effect of these substances was to inhibit infection rather than to inactivate the virus: (1) the effect of the aqueous extracts from cucumber embryos and tobacco seed was as marked immediately after addition to the inoculum as it was several hours later, while the decline in the infectivity of the treatments was consistently of the same order as that of the controls, and was not more than usually occurs through the decline in the infectivity of inoculum with age; (2) the effect of cucumber embryo extract depended upon the host used for infectivity measurements; (3) non-infective mixtures of inhibitor and inoculum were rendered infectious by dilution, indicating that either the inhibitors and the virus are so combined as to be readily dissociated by dilution or that the inhibitors are less tolerant of dilution; (4) with both viruses reduction in lesion numbers was greatest with concentrated inocula; (5) both extracts induced a highly significant reduction in the number of local lesions produced on the respective hosts (cowpea and *N. glutinosa*) when applied one or two days before the virus inoculum, but none when applied after it, suggesting that the inhibitor can only

interfere with infection and not with virus multiplication after infection has taken place; (6) the inhibitor from cucumber seeds significantly reduced lesion production when applied to the under surface of cowpea leaves, which were subsequently inoculated on the upper surface.

Both inhibitors were proteins. That obtained from cucumber embryos was heat-labile, non-dialysable, and could be precipitated from solution by alcohol or half-saturated ammonium sulphate. That from tobacco seed was heat-stable, non-dialysable, and was precipitated from solution by 60 per cent. alcohol, but not by three-quarters-saturated ammonium sulphate.

It is not thought possible that the presence of inhibitors in the embryos of seeds can prevent their infection by plant viruses, as the inhibitors are also present in other tissues, and these can certainly become infected. Cucumber mosaic virus was found in 92 per cent. of the testas and only 4 per cent. of the embryos of dried cucumber seeds, though the inhibitor is approximately equally present in both tissues. It is far more likely that the action of the inhibitors is upon the local lesion host used for measuring virus infectivity, either attaching itself to receptor sites in the cells where virus multiplication begins, or changing the physiology of the host cells so that they cannot support virus multiplication [cf. 32, p. 364]. It would seem that the theory that inactivators in seeds prevent the seed transmission of plant viruses [9, p. 413] must be abandoned, unless the inactivator is some transitory product of the metabolism of embryos. Such a product might be an enzyme or group of enzymes which breaks down virus particles, with other proteins of the endosperm, before they become absorbed by the developing embryo and resynthesized into embryo proteins. It could then inactivate viruses without accumulating to an extent detectable by the usual infectivity techniques.

Dickson (R. C.). **A working list of the names of aphid vectors.**—*Plant Dis. Reptr*, 39, 6, pp. 446–452, 1955. [Multilithed.]

This list of scientific names of aphid vectors of plant viruses, based chiefly on the publications of Miriam A. Palmer (The Thomas Say Foundation, 5, pp. 1–452, 1952) in America and of K. Heinze [*R.A.M.*, 31, p. 168] and C. Börner (*Mitt. thüring. bot. Ges., 1952*, 4, pp. 1–484, 1952) in Europe, is intended to help workers in this field in aphid identification. The list includes 344 names that have been applied to 137 species.

Magee (C. J.). **Report on survey of virus diseases of food crops in the Territory of Papua and New Guinea with special reference to plant quarantine. Part II.**—*Papua & N. Guinea agric. J.*, 9, 1, pp. 17–26, 6 figs., 1954.

A summary of this report on virus diseases in Papua and New Guinea has already been noticed [*R.A.M.*, 34, p. 138]. The importance of a rigid quarantine [see below, p. 348] is emphasized, since the Territory has so far escaped a number of virus diseases which are serious in other countries.

Jeener (R.). **The role of nucleic acid in virus multiplication.**—*Rev. Ferment.*, 10, pp. 122–124, 1955. [Abs. in *Chem. Abstr.*, 49, 20, col. 14093 f, 1955.]

The function of nucleic acid and proteins in virus multiplication is discussed. They are considered to be synthesized similarly to bacteriophages, i.e., in such a way that the process of multiplication does not intervene with the division of pre-existing particles as in the division of cells.

Watson (D. J.). **Botany department.**—*Rep. Rothamst. exp. Sta., 1953*, pp. 68–74, 1954.

In further work at Rothamsted [cf. *R.A.M.*, 35, p. 149] on the effect of darkness on the susceptibility of tobacco leaves to tomato aucuba mosaic virus [cf. 33, p. 653

and next abstract] E. C. Humphries and B. Kassanis found that variation in lesion counts did not always reflect variation in the nitrate content of similarly treated leaves. Decrease in dry matter and increase in water content occurring in tobacco plants kept in darkness were also correlated, probably independently, with the number of lesions. Changes in nitrate content induced by nitrogenous fertilizer had no effect on lesion numbers. Repeated spraying of the leaves with potassium nitrate solution before inoculation reduced the number of lesions, but this, presumably, was an effect of the salt outside the leaves, as similar results were obtained when it was added to the inoculum. Susceptibility was increased by keeping the plants at 37° C. in the light for one or two days, this treatment also increased the leaf nitrate.

P. C. Owen found that tobacco leaves with mosaic symptoms, removed from systemically infected plants three to four weeks after inoculation, usually had a lower respiration rate than comparable healthy leaves [35, p. 128].

The same author, noting that sugar beet plants infected with yellows virus in the field appear to wilt less readily than healthy plants, found that the rate of transpiration per unit area was lower for leaves of infected plants with yellows symptoms than for comparable healthy leaves, but higher in young infected leaves not yet displaying symptoms. Systemic infection with tobacco mosaic virus slightly increased the transpiration rate of attached tobacco leaves, while infection with aucuba mosaic virus had a similar but larger effect.

Pirie (N. W.). **Biochemistry department.** *Rep. Rothamst. exp. Sta., 1953*, pp. 75–82, 1954.

Experimental evidence is presented by G. H. Wiltshire that the number of lesions produced on a leaf by a virus is not a direct function of the ascorbic acid concentration. Loss of ascorbic acid from tobacco plants kept in the dark coincided with increase in susceptibility to tomato aucuba mosaic virus [see preceding abstract], but the loss at the time of greatest susceptibility was relatively small, and restoring the level did not confer resistance.

Pfeil (E.) & Kanngiesser (W.). **Papierelektrophoretische Untersuchung der Phosphatide gesunder und viruskranker Pflanzen in verschiedenen Stadien der Krankheit. II. Mitteilung.** [Paper-electrophoretic analysis of the phosphatides of healthy and virus-diseased plants in different stages of the disease. Note II.]—*Z. PflKrankh.*, 62, 11, pp. 705–711, 8 graphs, 1955. [English summary.]

The paper-electrophoretic separation of crude phosphatides from healthy and yellows virus-diseased beet and [potato] virus X-infected tobacco leaves into equal parts of pyridine, glacial acetic acid, and chloroform has already been reported (*Biochem. Z.*, 325, p. 12, 1953). Quantitative differences were demonstrated in the extent of the individual zones, reflecting disparities in the corresponding phosphatides. In the material used in those investigations the symptoms were fully developed. The present study at the Institute for Biochemistry, Hann.-Münden, Germany, was undertaken to determine whether typical electrophoretic gradient curves of diagnostic value could be obtained at a pre-symptomatic stage of the disease.

Young beet plants were inoculated a fortnight after sowing in the greenhouse in April, 1953, with two yellows virus strains isolated by Schlösser, 'normal' and 'needle-prick' [*R.A.M.*, 32, p. 528]. The first lot of leaves was harvested three months later and subsequent collections were made at fortnightly to three-weekly intervals. Electrophoretically recognizable differences in the composition of the total phosphatides from healthy and yellows-diseased foliage did not become apparent until 25th August (4½ months after sowing). Of the two zones moving to the anode the quicker was better developed than the slower with diseased leaves,

whereas with healthy ones the position was reversed. A cathode-attracted phosphatid, constituting only 8 to 10 per cent. of the phosphatids extracted from the total leaf substance, is one of the main components of the phosphatids yielded by centrifuged saps and beet and tobacco leaves. So far, no differences have been detected between the centrifugates from healthy and diseased material, suggesting that the electrophoretic variance of the phosphatids in the two groups may rest chiefly on divergences among those which do not pass into the expressed sap.

The phosphatids extracted from healthy and leaf roll virus-infected potato tubers of the Voran, Ackersegen, and Heida varieties displayed no clear-cut differences in their electrophoretic patterns, which comprised four well-defined zones.

Helms (Katie) & Pound (G. S.). **Host nutrition in relation to concentration of Potato virus X and Tobacco ring spot virus.**—*Phytopathology*, 45, 10, pp. 567–573, 3 figs., 1955.

At the Department of Plant Pathology, University of Wisconsin, *Nicotiana glutinosa*, Havana 38 tobacco, and National Pickling cucumber were grown in sand cultures watered with solutions containing different concentrations of nitrogen, phosphorus, and a balanced nutrient solution [cf. *R.A.M.*, 33, p. 690]. The *N. glutinosa* and tobacco plants were inoculated with potato virus X [35, p. 240] and the cucumbers with tobacco ring spot virus. The effects of nutrition on virus concentration in the three hosts were determined in assays made about a week and a fortnight after inoculation. Optical-density readings on semi-purified extracts from plant sap were made with both viruses, supplemented in the case of potato virus X by local-lesion assays.

The most striking effects on host growth, symptom expression, and virus concentration of both viruses were produced by nitrogen. At the lowest level of 21 p.p.m. symptoms were mild and virus concentration low. With rising nitrogen levels severity of infection and virus concentration increased up to the maximum of 1,050 p.p.m., which caused stunting of tobacco and *N. glutinosa* and death of the cucumber plants.

Mild symptoms and stunting were characteristic of the minimum phosphorus level of 3 p.p.m. At 93, 237, and 547 p.p.m. the symptoms were intensified and the virus concentrations higher, reaching a maximum at 237 p.p.m. in some experiments and at 547 in others.

With the balanced nutrient solution, the maximum growth of tobacco and *N. glutinosa* plants inoculated with potato virus X was at 0·5 H or 1 H (the basal level). The virus concentration also tended to reach a peak at 1 H[oagland], though in some of the tests it was highest at 2 H. Cucumber plants grew best at the minimum level of 0·5 H, and the tobacco ring spot virus concentration was invariably lowest at 3 H. The data suggested that below the 3 H level osmotic concentrations did not strongly affect multiplication of either virus. The methods of estimation of virus concentration used in these studies are regarded as adequate where differences between treatments were considerable, but not sufficiently precise for smaller ones.

Brakke (M. K.), Vatter (A. E.), & Black (L. M.). **Size and shape of wound-tumour virus.**—*Brookhaven Symp. Biol.*, 6 (*1953*), pp. 137–155, 1954. [Abs. in *Biol. Abstr.*, 28, 11, p. 2688, 1954.]

Extracts of sweet clover (*Melilotus alba* and *M. officinalis*) stem tumours produced by the wound-tumour virus (*Aureogenus magnivena*) [clover big-vein virus: *R.A.M.*, 24, p. 511; 33, p. 12; 35, p. 77] were approximately 100 times as infectious as extracts of tumour-free stem segments from the same plants, and were infective at a dilution of 10^{-5} when injected into the vector *Agallia constricta*. Visible zones containing most of the infectious material were present after density-gradient centrifugation of extracts from stem tumours on sweet clover or from viruliferous

A. constricta. Such zones contained high concentrations of dense bodies which in crude preparations appeared to be spheres, but in purer, dried preparations were observed to be polyhedra 80 mμ across. The virus from insects appeared in the electron microscope to be identical with that obtained from plants, and sedimented at the same rate through density-gradient columns. It had a sedimentation constant of approximately 600 Svedberg units. A small percentage of crimson clover (*Trifolium incarnatum*) plants, inoculated by pin-pricks in their crowns with extracts from stem tumours on sweet clover, developed the disease.

Pérez (J. E.) & Adsuar (J.). **Antigenic relationship between Puerto Rican Pepper-mosaic virus and a strain of Potato virus Y.**—*J. Agric. Univ. P.R.*, 39, 3, pp. 165–167, 1955. [Spanish summary.]

In precipitin tests to confirm the suspected relation between potato virus Y and the Puerto Rico [chilli] pepper mosaic virus [*R.A.M.*, 21, p. 401] antisera were prepared by inoculating two rabbits with clarified sap from tobacco plants infected with each virus separately. All four sera so obtained reacted with both antigens; cross-absorption tests revealed that the pepper virus possessed a minor antigenic component not found in the Y virus.

Adsuar (J.) & López Matos (L.). **Reaction of some Nicotiana species to the Pepper- and common Tobacco-mosaic viruses.**—*J. Agric. Univ. P.R.*, 39, 3, pp. 168–171, 1955. [Spanish summary.]

Filler-type tobacco in Puerto Rico is attacked by tobacco mosaic virus [*R.A.M.*, 33, p. 762], [chilli] pepper mosaic virus [see preceding abstract], and leaf-curl virus, of which the first two are the most important. In tests with 24 *Nicotiana* spp. *N. glauca* was the only one showing resistance to both these viruses.

Keleny (G. P.). **Plant introduction methods. Impressions gained during a visit to Fiji.**—*Papua & N. Guinea agric. J.*, 9, 1, pp. 13–16, 1954.

The plant introduction service of Papua and New Guinea is centred at Laloki, near Port Moresby, all introductions being sent there for quarantine [see above, p. 345] and later to an Experiment Station for establishment, further testing, and multiplication. In Fiji, the Plant Introduction Garden at Maduruloulou maintains a permanent collection of economic and ornamental plants which are multiplied for distribution. It is considered that the main functions of the Introduction Stations should be the acquisition of plants for experimental programmes. They could cater for a wider area and greater publicity should be given to their activities.

Harris (R. V.). **Plant pathology.**—*Rep. E. Malling Res. Sta., 1954*, pp. 34–37, 1955.

In this report [cf. *R.A.M.*, 34, p. 769] it is stated that in further experiments using a graded series of mixed inocula the saprophytic bacterium again affected the cherry bacterial canker disease (*Pseudomonas mors-prunorum*) [35, p. 198], this time by reducing the severity of successful infections rather than their number. Bordeaux sprays applied at the immediate post-crop stage seemed to retard the early build-up of leaf-surface populations on Napoleon cherry trees, but their effect on subsequent canker incidence remains to be seen. The spray trial on Schrecken cherry, continued for the third and final year, confirmed the efficiency of two autumn sprays combined with a spring spray.

The hop varieties C2, D1, D3, 1147, and Professor Salmon's Bramling Cross (OT 48) all tolerant of wilt (*Verticillium* [*albo-atrum*]) were again included in the Hop Research Institute's large-scale brewing trials, and J2 for the first time. The efficiency of Early Prolific as an indicator of nettlehead virus was finally established. The possible causal relationship of hop mosaic with the non-lethal Cobb's mosaic [on the variety Cobb] was investigated by cross-protection tests, with positive results.

The failure of the apple mosaic virus to become fully systemic, even after several years' infection, was confirmed.

A newly identified virus disease [see above, p. 305], with a rapid necrotic effect on cherry trees differing widely in age, occurred in three Kent orchards and may be present in many more. If its apparently wide distribution is confirmed by indexing tests, a systematic survey, probably followed by eradicant measures, will be required.

A similar degree of control of apple mildew [*Podosphaera leucotricha*: 34, p. 653] was obtained with standard lime-sulphur and a wettable powder based on dinitro-*sec*-octylphenol (DNOP), partially esterified with crotonic acid, but the former impaired skin quality.

The second successive season's results confirmed the earlier promise of captan in controlling *Botrytis* rot of strawberries [*B. cinerea*: 34, p. 604] and were further confirmed by *in vitro* and *in vivo* experiments [see above, p. 306].

New or uncommon plant diseases and pests in England and Wales.—*Plant Path.*, 4, 2, pp. 71–72, 1 pl. (between pp. 52 and 53), 1955.

Dorothy E. Fisher records (p. 71) that the perfect state of *Didymella lycopersici* [cf. *R.A.M.*, 34, p. 554] was found at Alcester, Worcestershire, on 4th November, 1954, on an outdoor crop of tomatoes affected by stem rot. The perithecia occurred at the upper edge of a basal stem lesion three to four inches long which extended to soil level, and from which the cortex had rotted away [cf. 24, p. 78]. Isolates from single ascospore cultures inoculated into tomato stems gave typical lesions bearing the pycnidia of the imperfect state, *Diplodina lycopersici*.

I. F. Storey states (p. 71) that during the autumn and winter of 1953–4 *Rhizoctonia* [*Corticium*] *solani* was found on the leaves and shoots of *Azalea* [*Rhododendron*] *indicum* and *A.* [*R.*] *japonicum* plants growing in a nursery at Norwich and severely affected by damping-off. The same fungus also destroyed the foliage of young plants on the floor of the greenhouse. Control of the disease was obtained by dusting with chloronitrobenzene. The same trouble has been recorded from America [*Quart. Bull. Amer. Rhododendron Soc.*, 8, pp. 82–86, 1954].

Second Annual Report, 1954–5, Scottish Horticultural Research Institute.—38 pp., 1 pl., 1955.

In the plant pathology section (by C. H. Cadman, pp. 24–27) of this report [cf. *R.A.M.*, 34, p. 770] raspberry ring spot viruses are recorded by the author and J. Chambers for the first time outside Scotland on Malling Exploit from Bere Ferrers, Devon, and in Malling Promise from the Bristol area, where *Anemone* plants were also affected. *Hyoscyamus niger* was found to be the best test plant for raspberry viruses. Leaf curl symptoms on Malling Jewel, Norfolk Giant, and other sensitive varieties were associated with a number of different ring spot viruses, different groups of viruses occurring in different localities and sometimes more than one virus in individual plants. During a search in plantations with leaf curl, ring spot viruses were isolated from nine weed species in one locality, but from fewer or none in others. Sugar beet is a host for nearly all the viruses from raspberries and weeds. In field and greenhouse experiments both raspberries and sugar beet became infected only when their roots were in contact with soil from diseased plantations, indicating some form of soil transmission.

Preliminary field results obtained by C. H. Cadman, A. G. Fisken, and Miss K. S. Anderson indicated that raspberry varieties differed greatly in their susceptibility to leaf spot, a component of the virus complex causing decline in Lloyd George. J. Chambers confirms that beyond a minimum exposure period of eight days there is little correlation between time of exposure of raspberry plants to heat treatment and the percentage of plants cured of virus infection.

In greenhouse experiments by C. H. Cadman and J. Chambers *Physalis floridana*

was more susceptible than *P. angulata* to inoculation with potato leaf roll virus by *Myzus persicae* [cf. 32, p. 499]. During 1953 King Edward potato plants infected by virus Y were rogued from experimental plots of healthy Majestic on 20th June. The virus spread as much as in the unrogued control plots although *M. persicae* was not recorded until early July. In a further experiment virus Y and leaf roll virus spread more in a planting made on 28th April than in earlier or later ones, and both viruses spread further from the infections in the late April and early May plantings than in the March and early April ones [cf. 31, p. 170]. In both experiments plants near those infected by virus Y or leaf roll became diseased more often than those more distant.

In the mycology section T. Swarbrick (p. 28) records preliminary work by W. R. Jarvis on the mechanism of resistance in strawberry to *Phytophthora fragariae*, which suggests that retardation or inhibition of terminal oxidase systems in the pathogen by resistant roots is important.

Plantesygdomme i Danmark 1953. Årsoversigt samlet ved Statens plantepatologiske Forsøg, Lyngby. [Plant diseases in Denmark 1953. Annual report compiled by the State Phytopathological Experiment Station, Lyngby.]—*Tidsskr. Planteavl*, 59, 3, pp. 369–432, 2 graphs, 1955. [English summary.]

Among numerous items of interest, some of which have already been noticed from other sources, the current report [cf. *R.A.M.*, 34, p. 575] contains the following information, contributed by O. Wagn, M. H. Dahl, H. R. Kristensen, and H. A. Jørgensen. Both manganese and copper deficiencies were exceptionally prevalent in cereals. Barley loose smut (*Ustilago nuda*) was very widespread, occurring in 1,085 out of 1,228 samples submitted for official inspection. The incidence of infection in the field ranged from 1 to 5 per cent. Yellow rust (*Puccinia glumarum*) developed sporadically in wheat crops from early June onwards, the Nord Desprez variety being particularly susceptible [34, p. 346]. On 2nd December, 1953, *Berberis sieboldii* was withdrawn by a supplementary proclamation from the list of barberry varieties authorized for cultivation [33, p. 521], since it was observed to bear aecidia of black rust (*P. graminis*).

Beets and swedes sustained heavy damage from boron deficiency, especially on the islands, where the rainfall was much lower than in Jutland. A spring application of borax at 15 kg. per ha. failed to remedy the condition in swedes. Downy mildew (*Peronospora schachtii*) [34, p. 347] was widespread and severe on beets during the spring, but the incidence of infection gradually declined and had fallen to a minimum by the end of July. On the island of Bornholm the tops of several beet crops were rendered unfit for ensilage by rust (*Uromyces betae*).

Club root (*Plasmodiophora brassicae*) appeared unusually early, occurring in a virulent form on swedes as early as mid-June and increasing generally from July to October.

Severe outbreaks of potato leaf roll were confined to stands raised from uncertified seed. Wart disease (*Synchytrium endobioticum*) was reported from 15 new municipalities. Spraying operations against blight (*Phytophthora infestans*) were greatly hindered by adverse weather conditions, and the tubers, especially of early and second-early varieties, were badly decayed. *Cercospora concors* [19, p. 6] was observed at the Studsgaard Experiment Station.

Botrytis allii was largely responsible for storage losses in onions, which should be thoroughly dried after lifting [cf. 35, p. 264] to prevent damage from this source.

P. infestans was destructive on tomato fruits and can only be held within tolerable limits by several fungicidal treatments.

Among other new records may be mentioned three suspected viroses, namely, apple proliferation on the Beauty of Boskoop variety [cf. below, p. 374], plum leaf roll [33, p. 95] on Reine Claude noir and Italian Prune plums, and gooseberry

vein-banding [33, p. 97]. Some 50 per cent. of the seedlings in a two-year-old planting of *Laburnum vulgaris* were affected by laburnum mosaic virus [33, p. 484]. *Zantedeschia aethiopica* plants developed chlorotic ring spots which subsequently became necrotic and are attributed to tomato spotted wilt virus [cf. 33, p. 655]. A virus tentatively assigned to the tobacco ring spot group was isolated from typical yellowish, circular spots on china aster leaves and transmitted by sap inoculation to White Burley tobacco, *Nicotiana glutinosa*, *N. rustica*, petunia, zinnia, *Amaranthus caudatus*, and *Tetragonia expansa*, producing local lesions on most of these species.

Cercosporella herpotrichoides, very common on wheat and barley [18, p. 385], was observed on oats, apparently for the first time in the country.

New hosts of plum rust (*Tranzschelia* [*Puccinia*] *pruni-spinosae*) in Denmark are peach, apricot, *Prunus tenella*, and *P. triloba*.

Another new record for the country is *Hyponectria buxi* on box leaves [cf. 25, p. 194] in parks and cemeteries near Copenhagen, where the plants were affected by a severe die-back. The fungus was nearly always found in conjunction with *Macrophoma mirbelii*, perhaps the primary pathogen.

Report of the Plant Diseases Conference held at Hawkesbury Agricultural College, New South Wales, June–July, 1955. Volume I.—308 pp., 1955. [Mimeographed.]

At the second Australian Plant Disease Conference [*R.A.M.*, 35, p. 92] C. J. Magee (pp. 7–18) discussed major changes in the plant disease position since the previous Conference, held in 1949. Among the new invaders are cherry leaf spot (*Coccomyces hiemalis*) [30, p. 216] and a new *Nectria* sp. causing canker on apple in Tasmania, found in 1954. The latter causes symptoms resembling those of *N. galligena*, but is a different species, probably belonging to the *Stilbella* group. antirrhinum rust (*Puccinia antirrhini*) [32, p. 316; 35, p. 3] spread within 18 months to Victoria, Queensland, South Australia, and Tasmania. *Fusarium oxysporum* f. *gladioli* [32, p. 255] on gladiolus, first recorded in Brisbane in 1950, is now widely distributed in New South Wales, and is probably also present in a few localities in Western Australia. Yellow slime of hyacinths (*Xanthomonas hyacinthi*) was newly recorded from Tasmania in 1947 and was found in Sydney in 1954. In two Adelaide nurseries *Urocystis cepulae* [33, p. 656] on onion was a new record in 1950. In 1953 *Sclerotinia trifoliorum* was observed on white clover in Tasmania, and identified on a host basis, but might in fact be *S. sclerotiorum*. A stem rot of cowpea caused by *Phytophthora* sp. [33, p. 136] caused serious losses in Queensland in 1952. In 1951 powdery mildew (*Oidium*) on begonia was recorded in Tasmania and became widespread in New South Wales during 1953.

Included among those pathogens which have become more prominent on cereals since 1949 are races 222 of wheat stem rust [*Puccinia graminis*], 135 and 138 of wheat leaf rust [*P. triticina*], 3, 7, and 8 of stem rust of oats, and 9, 57, 77, 102, and 103 of oat crown rust [*P. coronata*]. Victoria blight of oats (*Helminthosporium victoriae*) has caused serious losses in Queensland [33, p. 666]. During the wet 1950 to 1951 season *Septoria nodorum* [30, p. 559; 33, p. 21] was severe on wheat in New South Wales; the persistence of this pathogen under long rotations needs further elucidation.

The most serious disease of subterranean clover in New South Wales is *Uromyces trifolii* [34, p. 727]. Anthracnose (*Colletotrichum trifolii*) [34, p. 726] was first observed on red clover in New South Wales in 1952–3. Clover virus diseases [loc. cit.] and non-parasitic disorders are widespread and in the wetter areas of South Australia *Urophlyctis alfalfae* is common. Violet root rot of lucerne (*Helicobasidium purpureum*) has increased in severity in Queensland [29, p. 203] recently.

Helminthosporium turcicum [34, p. 284] has become more prominent on maize in New South Wales since the introduction of hybrids. During the last three or four years head smut (*Sphacelotheca reiliana*) [33, p. 209] has become established on sorghum and *Sclerotium bataticola* [*Macrophomina phaseoli*] is a recent record on the same host.

Potato black leg [*Erwinia atroseptica*] is of major importance in Tasmania [34, p. 742]. Parsnip canker (*Itersonilia* sp.) [35, p. 162] was found in Victoria in 1952 and in Sydney in 1954. As a result of the displacement of sulphur fungicides by dithiocarbamates, apple powdery mildew [*Podosphaera leucotricha*: 34, p. 461] has increased in importance in Tasmania. Wilt of passion fruit (*Fusarium oxysporum* f. *passiflorae*) [35, p. 203] has spread to four localities in New South Wales. Custard apple rots are caused by a number of fungi in Queensland, including *Phomopsis anonacearum*, *Phytophthora palmivora*, and *Botryodiplodia theobromae* [34, p. 42]. Fruit rots of avocado pear and banana and a die-back of roses in Queensland have been attributed to *Botryosphaeria ribis*; northern leaf spot of papaw is caused by *Corynespora cassiicola* [cf. 32, p. 342].

Among pathogens which have declined in importance are tomato spotted wilt virus [34, p. 285], potato virus Y [34, p. 742], and *Xanthomonas vasculorum* [34, p. 183] and Fiji disease virus [loc. cit.] on sugar-cane. The incidence of banana bunchy top virus [33, p. 211] has continued to decline in both Queensland and New South Wales.

J. Walker (pp. 19–20) stated that two means of dissemination of antirrhinum rust in Australia were by wind-borne uredospores and the transport of diseased seedlings and cuttings. The information contributed by G. S. Purss (pp. 21–22) on the *Phytophthora* stem rot of cowpea has already been noticed from another source [33, p. 136]. A high degree of resistance is displayed by three varieties obtained from the United States, viz., Blackeye 5, Chinese Red, and an unnamed introduction from Cuba.

G. C. Wade (pp. 23–31) discussed the problem of brown rot (*Sclerotinia fructicola*) [34, p. 793 *et passim*] of stone fruits in Australia. The pathogen constitutes a major problem in Victoria, New South Wales, Queensland, and Tasmania, is unimportant in South Australia, and does not occur in Western Australia. Incidence varies with the type of season from less than 5 per cent. to 20 per cent. in Tasmania, while losses of 50 to 100 per cent. have been sustained in the coastal belt of New South Wales when control measures have been neglected. Average losses over the past five years in the Murrumbidgee Irrigation Area have been 5·2 per cent.

Under Australian conditions it is doubtful whether apothecia play a large part in initiating infections, conidial development on mummies both on and off the trees and on infected twigs appearing to be more important. Recently evidence has been obtained of the occurrence of latent infection in green fruits (especially apricots), and the removal of infected twigs during the period between 'shuck-fall' [calyx-drop] and the commencement of ripening, when the fruit is not susceptible, is a control measure widely practised in Tasmania. In Victoria control has been obtained with Bordeaux mixture at the pink bud stage, followed by lime-sulphur for cover sprays; for apricots ziram has been recommended. In further experiments with thiram in Tasmania [33, p. 361] in 1953–4 and 1954–5, sprays applied at full bloom, petal-fall, and 'shuck-fall' reduced brown rot incidence from 7·2 per cent. on unsprayed trees to 1·3 per cent. A similar schedule omitting the third spray failed to give significant control, but the importance of such additional sprays is probably dependent upon the weather. A pre-harvest spray of thiram, used after a full schedule, can reduce the development of the disease in storage. It has been suggested that brown rot is more severe on waterlogged than on well-drained soils [35, p. 161 and below, p. 375], but the evidence is conflicting. The observation in

Tasmania that potassium deficiency influenced the susceptibility of apricots to *S. fructicola* [33, p. 361] is not of general application.

Dealing with the problem of black spot [scab: *Venturia inaequalis* and *V. pirina*: 34, p. 460] on apples and pears, K. E. Hutton (pp. 32–37) noted that the climate in the highlands of Australia is particularly favourable to its development. The possibilities for control of scab have improved in the past six years and it now remains for a reduction in losses to be effected. It has frequently been shown that an increased measure of control is achieved where the interval between the three sprays subsequent to 'pinking' does not exceed two weeks. Diminished costs, while retaining a similar degree of control, may be obtained by reducing the concentration of the early Bordeaux sprays from 15–15–100 to 10–10–100. Newer fungicides such as captan and thiram [loc. cit.] can be applied at any time during the blossoming period without adversely affecting fruit set. Control equal to that given by lime-sulphur is also possible with ziram, or with some limitations, phenyl mercuric chloride or phenyl mercuric dinaphthyl methane disulphate.

In most pome fruit orchards in New South Wales sod culture, chiefly with subterranean clover, is practised, permitting the ingress of heavy vehicles and the renewal of a protective fungicide cover immediately after rain. Automatic low volume concentrate spraying is being adopted and will probably become a permanent method of control in orchards exceeding 25 acres with trees over 15 feet high. *In vitro* tests have demonstrated that the minimum concentration of phenyl mercuric chloride, the least phytotoxic of the chemicals used, required to prevent the development of *Venturia* perithecia in infected apple leaves lies between 0·1 and 0·01 per cent.

Advances made in fungicides were reviewed by W. Cass-Smith (pp. 38–47), with a useful table containing ratings of fungicides tested for the control of various fruit and vegetable diseases in Australia. Protective foliage fungicides such as thiram, zineb, and ziram are imported into Australia as concentrates and then formulated, an important process which may affect field performance if not done correctly. Captan, however, is imported as a 50 per cent. dispersible powder.

Results obtained in tests with concentrate sprays had, according to J. R. G. Morschel (pp. 48–49), justified their initiation, and M. B. Spurling (pp. 50–56) reported that a number of Australian-made concentrate sprayers are now available. The most important feature of these machines is their labour-saving ability, since with them one man can spray 10 to 15 acres per day. Disadvantages include the danger of overspraying, the necessity for opening out the centres of large trees to permit penetration, and incompatibilities and phytotoxicities which may occur with concentrates. Future developments should be concerned more with spray formulation than with machine design, although the lateral penetration from Australian machines requires improvement.

The use of antibiotics in plant pathology was outlined by J. H. E. Mackay (pp. 57–63) with reference to particular problems in Australia [cf. 33, p. 330; 34, p. 100] and New Zealand [34, p. 795].

N. T. Flentje (pp. 65–70) dealt with the general principles involved in the control of soil-borne diseases and stressed the need for a basic study of the balance between saprophytes and parasites in the soil.

Recent advances in the control of air-borne diseases were described by K. O. Müller (pp. 71–87), who showed that the velocity with which a disease progresses in a given plot under continuously favourable weather conditions may be expressed mathematically, but the number of variables involved and their interrelationship with fluctuating environmental factors all contribute to the complex that determines the build-up of an air-borne disease to epidemic proportions. He then discussed a number of recent observations concerning the epidemiology of air-borne diseases. The arid climate of central Australia is certainly an obstacle to the

spread of rust strains from eastern to western Australia and vice versa. Reference was made to ways of minimizing the initial spore load essential for an epiphytotic by destroying the resting stage of the parasite. It was emphasized that field resistance, a term predominantly applied to air-borne diseases, and resistance due to supra-sensitivity vary independently of each other. In surveying recent work on the forecasting of epidemic air-borne diseases it was noted that climatic factors vary in importance in different parts of the world. To understand apparent anomalies supplementary studies on individual microclimates in crops are necessary.

P. May (pp. 88–89) discussed the depressing effect of high temperatures on the incidence of vine downy mildew [*Plasmopara viticola*: 34, p. 699], stating that it has been overestimated in the past. Under Murray Valley conditions rain rather than temperature is the determining factor for the incidence of downy mildew and it is advisable to continue spraying after hot and dry weather if the disease has occurred earlier in the season.

Recent advances in the principles of breeding and selection for disease control in crops other than cereals were outlined by S. L. Macindoe and K. S. McWhirter (pp. 90–99) in relation to the necessity for closer integration of genetics and plant pathology. Selection from the bean [*Phaseolus vulgaris*] variety Brown Beauty of a line resistant to strain 1 of *Colletotrichum lindemuthianum* [34, p. 436] was described by J. Walker (p. 100). J. C. Johnson (pp. 101–103) discussed further breeding for disease resistance with this variety [31, p. 3]. Sources of resistance to all bean diseases, with the exception of *Sclerotinia* [*sclerotiorum*] rot, are available. Recent advances in the principles of cereal rust control, mainly by the use of resistant varieties [see below, p. 362], were described by A. T. Pugsley (pp. 104–108).

J. Walker (pp. 109–115) discussed the present position in Australia with regard to seed and bud certification schemes, while C. G. Hughes (pp. 116–117) dealt with the certification of sugar-cane planting material, and G. S. Purss (pp. 118–120), the provision of propagating material of bananas free from *Fusarium oxysporum* f. *cubense*, and virus-free citrus budwood and strawberry runners.

Lilian R. Fraser (pp. 121–135) noted that virus diseases of citrus [see below, p. 365] had become prominent since the last conference. In Australia stem-pitting [virus] of grapefruit [34, p. 33] and tristeza [35, p. 82] are now being investigated, together with allied diseases, including citrus psorosis, lemon crinkle leaf, lemon shell bark, Joppa bud-union ringing, citrus enation [34, p. 706], and citrus scaly butt [34, p. 33]. It is believed that tristeza was well established in New South Wales by 1870, and possibly shipments of nursery trees from Sydney to Argentina in 1928 contributed to the introduction of the disease into South America.

As a result of an exhaustive survey of all the available citrus varieties in New South Wales, and by the use of a wide range of indicator seedlings, it is considered that two viruses are present in the tristeza complex. One of them, stem-pitting, which has a number of strains, caused vein-flecking and xylem-pitting of West Indian lime seedlings in varying degree. The other caused in addition yellowing and cessation of growth in West Indian lime. It is only when this 'yellows' component is present that tristeza is produced in sweet orange on Seville test seedlings, and this is considered to be the tristeza virus. Stem-pitting of grapefruit is not regarded as a component of the tristeza complex in Australia.

L. L. Stubbs (pp. 136–140) discussed the position in Australia with regard to virus diseases of strawberry and raspberry. Heat therapy applied to strawberry viruses has so far been inconclusive in Victoria. He also discussed some diseases of the vine (pp. 141–142) on which very little experimental work has hitherto been carried out, although some varieties exhibit virus-like symptoms. The same author also dealt with virus diseases of apples and pears (pp. 149–154) and of vegetables (pp. 167–171), stating that lettuce mosaic virus [33, p. 652] is a serious disease of

winter and spring crops in southern Australia. The complex infection causing spinach yellows in Victoria has been resolved into a persistent unknown yellows virus and a strain of cucumber mosaic virus. High tolerance of onion yellow dwarf virus was shown by the variety Hunter River White. In a further paper (pp. 268–271) he dealt with the problem of virus introduction in nursery stock and the necessity for revising quarantine measures.

The virus diseases of stone fruits in Australia were considered by N. C. Crowley (pp. 144–148), 12 having been observed since 1949. Peach mosaic and cherry mottle are already widespread, while peach rosette mosaic, cherry crinkle leaf, and cherry decline cause losses in localized areas. Stone fruit viruses in Australia have been named according to their resemblance to diseases described elsewhere. With the exception of peach rosette mosaic control is not difficult because the only important method of spread is by means of infected plant material. It is now essential for Australian workers to adopt a standard set of differential hosts to facilitate the identification of these viruses.

Further developments in the diagnosis and control of potato virus diseases in Australia were outlined by R. D. Anderson (pp. 155–163) [34, pp. 475, 742, *et passim*], and in New South Wales in particular by R. J. Conroy (pp. 164–166).

W. S. Sutton (pp. 172–174, 175–177) described two virus diseases of tomato, namely, drop head wilt, which may be caused by a mutant of tobacco mosaic virus, and an unidentified yellowing disease, which reaches an infection level of 25 to 100 per cent. in a quarter of the crops grown in the Sydney Metropolitan Area, and may be related to yellow dwarf virus of tobacco.

Virus diseases of tropical crops were discussed by T. McKnight (pp. 178–184), with reference to those affecting sugar-cane, banana, pineapple, groundnut, papaw, and passion fruit. Tomato big-bud virus is severe on a number of crops under tropical and sub-tropical conditions in Queensland.

The cytology of viruses in plants was dealt with by N. H. White (pp. 185–186), while M. F. Day (pp. 187–198) reviewed the possibilities of vector suppression as a means of control of phytopathogenic viruses, for example, banana bunchy top, and said that more attention should be paid to the use of insecticidal sprays on crops which provide sources of inoculum. M. Zaitlin (pp. 199–207) stressed the importance of serology in plant virus investigations and emphasized the need for its further study by competent serologists.

Australian pasture diseases and their present and potential importance were dealt with by G. C. Wade (pp. 208–215). The most important are those prevalent and tending to increase in improved pastures, so that disease resistance should be a main objective in pasture breeding programmes. Pasture legumes are a potential source of virus infection for pea and bean crops. The information on clover rugose leaf curl virus contributed by W. E. Grylls (pp. 216–217) has already been noticed from another source [34, p. 515].

The present position with regard to cereal root rots in Australia was reviewed by F. C. Butler (pp. 218–228), take-all (*Ophiobolus graminis*) being the most troublesome, except in Queensland and Tasmania. Improved methods of control must aim at producing conditions unfavourable to the development and survival of the root rot pathogens in the soil. C. R. Millikan (pp. 229–239) discussed mineral deficiencies and the factors affecting their manifestation, work in Australia being concentrated on surveys to determine the extent to which these disorders occur; the effects of cultural practices on deficiencies; the relative mineral requirements of crop species and varieties; the biological estimation of the availability of minerals in the soil; and radio-active tracer studies.

E. G. Hall and R. N. Robertson (pp. 252–256) dealt with storage diseases and disorders of citrus, pome fruits, grapes, and potatoes. Latent infections in relation to certain fruit wastage of citrus were discussed by T. B. Kiely (pp. 257–261),

who quoted earlier work on the dormant infection by *Guignardia citricarpa* [30, p. 566]. Bordeaux mixture sprays appeared to inhibit the development of lesions from latent infections by retarding the onset of senescence in the fruits, as well as providing protection from initial infection. K. E. Hutton (pp. 262–267) dealt with the diseases due to *Pseudomonas syringae* [35, p. 3], which causes the most severe losses of Rosaceae in Australia.

The views expressed at the Fifth Commonwealth Mycological Conference [35, p. 81] regarding the need for quarantine action against seed-borne diseases were presented by T. H. Harrison (pp. 272–275), who suggested that the relevant resolution [No. 2, *Rep. Commonw. mycol. Conf. 1954*, p. 11] of the conference be affirmed in Australia. The problem of rapid diagnosis of major bacterial diseases [*R.A.M.*, 35, p. 82] such as apple and pear blight (*Erwinia amylovora*) and citrus canker (*Xanthomonas citri*), using specific sera or bacteriophages, was discussed by C. R. Millikan (pp. 276–280). S. Fish (pp. 281–294) reviewed the action taken in regard to resolutions passed at the [Australian] Plant Diseases Conference, 1949.

In an appendix the pathology of rice in the Northern Territory is described by W. Stahl (pp. 296–308). The most important diseases are *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: C.M.I. map No. 92], *Cercospora oryzae* [No. 71], and *Piricularia oryzae* [No. 51]. Other rice-growing areas of Australia, including New South Wales and Western Australia, but not Queensland, are claimed to be free from rice diseases.

Report of the Waite Agricultural Research Institute, South Australia, 1952–1953.—70 pp. [? 1954. Received 1955.]

In the section of this report [cf. *R.A.M.*, 33, p. 656 and preceding abstract] dealing with plant pathology (pp. 25–31) the continued investigation of bare patch disease caused by *Rhizoctonia* [*Corticium*] *solani* [33, p. 356], very common on lighter soils, is reported. In general, single-basidiospore cultures from a wide range of strains of *Pellicularia filamentosa* [*C. solani*], though differing widely in other respects, possessed similar pathogenic characteristics to the parents. Two strains formed the perfect state in agar culture. *C. solani* has been recovered from soil well removed from the nearest bare patch in affected fields. Evidence is accumulating that the pre-penetration activity of the pathogen is augmented by a chemical stimulus from the host, causing the fungus to produce a diffusible substance which kills the host cells.

Unthriftiness of lucerne [loc. cit.] has not been correlated with any parasitic organism.

In studies on the ecology and pathogenicity of *C. solani* and *Sclerotinia homoeocarpa* [35, p. 161], causing 'brown patch' and 'dollar spot' of turf, respectively both fungi had similar requirements with respect to temperature, pH, and humidity. In the field *S. homoeocarpa* forms spots only 2 in. in diameter, whereas those of *C. solani* are up to 10 ft., due to the superiority of the latter as a saprophyte in competing with other soil micro-organisms. Both fungi affect a wide range of hosts. *S. homoeocarpa* causes stunting by the liberation of a toxin rather than by actual hyphal penetration. The growth of *C. solani*, which produces runner hyphae in soil but forms dense colonies in turf, is stimulated in the rhizosphere of susceptible plants.

The browning of vascular tissues in potatoes was due to infection by a *Fusarium*.

Bordeaux mixture sprays in spring and autumn do not always give satisfactory control of *Clasterosporium* [*carpophilum*: see below, p. 377] on orchard crops in the Adelaide and Murray River areas. In studies on *Cytosporina* sp. [34, p. 795] associated with apricot gummosis [see below, p. 376], it has been established that the *Cryptovalsa* sp. found on dead apricot wood has no connexion with *Cytosporina*, nor is it pathogenic to apricots. The *Cytosporina* spores have not been germinated *in vitro*, nor have they caused infection when inoculated on apricots. Silver leaf

(*Stereum purpureum*) seriously damaged orchard crops in the Adelaide Hills. The first record in South Australia of citrus bud-union decline was confirmed on navel oranges; *Phytophthora* collar rot is of increasing importance. Latent infections of *Alternaria* and *Colletotrichum* cause heavy losses of stored oranges. A species of *Pythium* is suspected to be partly responsible for the dying of vines.

In Adelaide *Sclerotinia* [*gladioli*] caused serious losses of gladioli in nurseries. Rose wilt virus [34, p. 283] was severe in 1952–3 and the first occurrences of *Monochaetia unicornis* on *Cupressus* spp. [35, p. 3] in the State were noted.

In further work on the decline of cherry in the Adelaide Hills it was shown that the varieties Napoleon and Beauchamps Black are almost symptomless carriers of the causal virus. The disease is transmitted by grafting to William's Favourite, on which a severe necrosis was induced.

Records are to be compiled for the eventual production of a fungus flora of Australia.

Administration Report of the Director of Agriculture Trinidad and Tobago for the year 1954.—xi+98 pp., 1 fig., 1955.

In this report [cf. *R.A.M.*, 34, p. 709] it is estimated (p. 28) that the considerable incidence of black pod disease [*Phytophthora palmivora*] and cherelle wilt of cacao, which occurred following heavy rain at the end of 1954, would, together with witches' broom disease [*Marasmius perniciosus*], reduce cacao production by some 5,000,000 to 6,000,000 lb. in 1955.

The experiments on the dying-out of seedling limes (p. 41) have as yet given no conclusive evidence of a soil-borne pathogen.

Annual Report on the Department of Agriculture of the Northern Region of Nigeria, 1952–53.—76 pp., 1 diag., 1 map, 1955.

In the botany section (pp. 31–54) of this report [cf. *R.A.M.*, 35, p. 164] A. R. Maurer reports that although sugar-cane red rot (*Colletotrichum falcatum*) [*Glomerella tucumanensis*] is still spreading the pathogen caused less damage than in the previous year.

Groundnut rosette virus [25, p. 494] was found at all the stations visited by the author but did not cause much damage in the north. Leaf spot (*Cercospora personata*) [C.M.I. map No. 152] was prevalent in all areas, particularly on early varieties. Root rot (*Sclerotium rolfsii*) seriously affected nearly all the groundnut experimental plots at the Bida Farm.

A wilt of benniseed [sesame] was tentatively assigned to *Macrophomina phaseoli* [cf. *R.A.M.*, 32, p. 176].

Covered smut [*Sphacelotheca sorghi*] of guinea corn [*Sorghum guineense*] occurred in all areas and seed treatment with copper carbonate was recommended.

In the cotton section (pp. 58–71) H. E. King states that bacterial blight (*Xanthomonas malvacearum*) was more prevalent than during the previous two seasons. Differences in severity of symptom expression between lines were not related to differences in yield, the susceptible HU8A outyielding lines of known high resistance.

Department of Agriculture, Kenya, Annual Report 1953. Vol. II.—205 pp., 1955.

In the section (pp. 12–18) of this report [cf. *R.A.M.*, 35, p. 92] by the senior research officer (plant pathology [R. M. Nattrass]) it is stated that during 1953 indigenous and exotic varieties of *Hibiscus cannabinus* growing in Kenya were affected by canker due to *Botrytis cinerea* [cf. 34, p. 436]. *Glomerella cingulata*, which in 1952 was restricted to the Cuba variety, affected the Florida strain at the Scott Laboratory in 1953, infection apparently being seed-borne; it was controlled by pruning and spraying with perenox.

Geranium plants, grown for essential oil, were attacked by stem canker (*Phomopsis* sp.) and by *Armillaria mellea* in various localities. *Rhizoctonia* [*Corticium*] *solani* caused a crown rot of pyrethrum [*Chrysanthemum cinerariifolium*].

In inoculation experiments on brown spot (*Alternaria passiflorae*) of passion fruit, three kinds of leaf infection were distinguished. When the lesions were present on the margins or between the main veins, no serious effect was produced for three to four weeks, after which the affected leaves turned yellow and fell. If one or more of the three main veins was infected, yellowing and abscission followed rapidly. Petiole infection did not cause leaf-fall, presumably because the formation of the abscission layer was prevented; the fungus spread slowly into the stem, forming a canker.

With the help of the inoculation technique recently devised [35, p. 93], studies of bud disease (*Ramularia* [*bellunensis*]) of *C. cinerariifolium* were continued. Observations in the field and laboratory indicated that penetration of the bud is unlikely to occur elsewhere than through the bracts. After inoculation a period of three to four weeks elapses before discoloration of the bracts can be seen. In view of the time required by the fungus to affect the growth of the bud, any dead bud under 4 mm. in diameter is unlikely to have been killed by *R. bellunensis*. A 'false bud disease' not associated with the fungus sometimes affects the older buds.

In the report (pp. 127–132) of the agricultural officer (pyrethrum) C. Kroll states that incidence of *R. bellunensis* was higher in 1953–4 than in the previous season, though the reason for this was not clear.

In the report of the senior plant breeder (pp. 35–63), H. C. Thorpe, it is stated that wheat stem rust (*Puccinia graminis tritici*) was widespread in certain varieties, notably 294.M. K. Settler, and 360.H, but in most the attack occurred too late to cause damage. *P. triticina* was less prevalent than before, but *P. glumarum*, at the higher latitudes, was more severe, particularly on 1066 wheat; the new variety R 64 was severely affected at Kipipiri and on the Kinangop at 8,300 ft., and should not be grown at altitudes over 8,000 ft. Glume blotch (*Septoria nodorum*) was present only to a slight extent, probably owing to the dry season, though Cross 318 on the Kinangop was severely affected. Take-all (*Ophiobolus graminis*) [34, p. 778] has increased in recent years. While the disease can occur on land newly broken from grass, its presence usually indicates that the land has been under wheat continuously for too long. It was very severe on the Kinangop, where frost also caused extensive damage, especially in localized, low-lying areas. Cross 318 appears to be particularly susceptible to damage by both frost and take-all; R 64 and Sabanero are much more resistant to frost.

In 1953 an experimental programme was begun at the Department's station at Kibarani, on the coast, with the object of transferring resistance to *Puccinia polysora* [cf. 33, p. 420] from introduced lines of maize to adapted local varieties. The practical difficulty encountered was to distinguish between susceptible and resistant plants before flowering, as the fungus did not build up in the field in 1953 until after flowering. If this occurs again, consideration may have to be given to creating an artificial epidemic.

In the report (pp. 64–66) of the plant pathologist (plant breeding), A. D. S. Duff states that of the two new forms of wheat stem rust [35, p. 93], K 14 was obtained from R 64, while K 13 was found on 360.H, previously susceptible only to K 11. *P. graminis* continued to be the major wheat pathogen. Some wheat varieties were found to have been attacked in the field by a form of stem rust to which they had been resistant as seedlings. It appears, therefore, that in wheat breeding work with certain crosses, mature plant tests will have to be undertaken in addition to seedling tests, if the full rust resistance is to be evaluated.

Helminthosporium [*Pyrenophora*] *teres* and *Rhynchosporium secalis* were prevalent on barley at the Plant Breeding Station; *Puccinia graminis* was also present, and

Ustilago nuda occurred on some crops. Some oat varieties at the Station were partly destroyed by *P. graminis* and *P. coronata*. On maize *H. turcicum* and *P. sorghi* were common. *Fusarium graminearum* [*Gibberella zeae*] and *Nigrospora oryzae* [33, p. 140] were isolated from rotted maize cobs. A heavy attack by *P. sorghi* occurred on *Euchlaena mexicana* in breeding-cages.

Stapp (C.) & Knösel (D.). **Phasenoptisch-cytologische Untersuchungen sternbildender Bakterien.** [Phase contrast-cytological studies of star-forming bacteria.]—*Zbl. Bakt.*, Abt. 2, 109, 1–4, pp. 25–41, 4 pl., 1 diag., 1956.

In studies with the phase-contrast microscope on living material of *Agrobacterium tumefaciens*, *A. radiobacter*, and *A. stellulatum* the position and number of the nuclei (which appeared as dark, spherical granules in the lighter cell) in all stages of the star cycle were in complete agreement with the findings of previous electron-microscopic investigations on stained preparations [*R.A.M.*, 34, p. 215].

Desrosiers (R.) & Díaz (J.). **An exploratory field trial of fungicides for the control of Monilia.**—*Cacao* (*Int.-Amer. Cacao Cent.*), 3, 8, p. 2, 1955.

In a fungicide trial during 1954 at Turrialba, Costa Rica, on the control of *Monilia* pod rot of cacao [*M. roreri*: cf. *R.A.M.*, 34, p. 354 and next abstract], the following were used per 100 gals.: 10 lb. wettable sulphur, 2 lb. parzate, 1 lb. yellow cuprocide, 2 lb. zerlate and fermate, and 1·5 lb. COCS applied at seven- to ten-day intervals from January to November by a Hardy 99 sprayer, at 400 lb. pressure. Wettable sulphur, parzate, and yellow cuprocide averaged 2·4 per cent. infected pods compared to 16·8 on the unsprayed, the other three averaging 7·3. As regards yields, however, wettable sulphur was best, giving an increase of 290 per cent. in the pods produced. Cuprocide had no effect on yield, and the other four were somewhat less effective than wettable sulphur. The effect on yield is presumably correlated with the control of other less important diseases, epiphytes, and possibly insects, at the same time. The cuprocide is probably toxic to the trees.

Orellana (R. G.). **Monilia pod rot of Cacao.** —*Cacao* (*Int.-Amer. Cacao Cent.*), 3, 9, pp. 3–4, 1955.

This disease (*Monilia roreri*) [see preceding abstract] is indigenous to Ecuador and is at present confined to that country, Colombia, and Venezuela [C.M.I. map No. 13]. Infection takes place through wounds caused by insects of the Pentatomidae on the lower part of the peduncle. It has been suggested that spores of the fungus may survive in the soil, and it is indicated that they are carried by air currents and other methods of transport. Venezuelan cacao was found to be more susceptible than cacao 'Nacional' of Ecuador; *Theobroma bicolor* and *T. balaoensis* have been found heavily infected. Further and more detailed studies of all aspects of the disease are needed in order to control it effectively.

El cultivo del Cacao. [Cacao cultivation.] —*Bol. Direcc. Agric. Méx.* 8, 73 pp., 4 col. pl., 12 figs., 1 diag., 1 map, 1953 (published 1954).

Part I (pp. 11–37) of this publication deals with problems concerning cultivation of cacao in Mexico, and the first section of part II (pp. 39–61) with the symptoms and control of the principal diseases [*R.A.M.*, 28, p. 328; 32, p. 69].

Henderson (F. C.). **Cacao as a crop for the owner-manager in Papua and New Guinea.**—*Papua & N. Guinea agric. J.*, 9, 2, pp. 45–74, 9 figs., 6 diags., 1954.

In the section dealing with the diseases of cacao in Papua and New Guinea (pp. 58–60) [*R.A.M.*, 31, p. 9] it is stated that damage caused by *Phytophthora palmivora* is significant only on the pods. It is advisable to remove infected pods at two- or three-weekly intervals throughout the year; these can be left lying in the field without causing re-infection. The incidence of root diseases, mainly *Fomes lignosus*, *F. noxius*, *Ganoderma* [*pseudoferreum*], and *Ustulina zonata* varies with the district,

the south coast of Papua being relatively free. Living cacao trees are used to trace sources of infection in newly cleared land; if a tree becomes diseased it is removed and burnt *in situ* together with all roots and stumps and other infected material of the old jungle trees in the area.

Annual Report of the West African Cocoa Research Institute, 1954–55.—110 pp., 1 pl., 1955.

In the section of this report [cf. *R.A.M.*, 35, p. 168] dealing with virus research (pp. 30–45) further information is given by T. W. Tinsley concerning the host range of cacao viruses. Natural infection of the baobab (*Adansonia digitata*) occurs in the savannah woodland north and south of the forest belt, but no infected trees have yet been recorded from cacao areas in the Eastern or Western Provinces of the Gold Coast, though cases occur on the Accra plains. Occurrence of infected *Adansonia* far (140 miles) from cacao affected by swollen shoot suggests that either the virus has spread to it from another host or it is primarily a virus of this tree, the distribution of which has been recorded from Senegal to North Transvaal. It is not native to the Gold Coast, probably originating from the Sudan Savannah zone. It is often propagated by cuttings, and it can be postulated that the virus infection came to the Gold Coast from the North.

A revised list of species of Tiliales tested is tabulated, indicating susceptibility to cacao viruses or otherwise. The susceptibility of *Guazama ulmifolia* is now considered doubtful. Species of Malvaceae and Euphorbiaceae tested have shown no infection.

Study of the conditions governing transmission of cacao virus by W. T. Dale indicated that starving had no direct effect on the rate of transmission by *Pseudococcus njalensis*. This vector may acquire the virus in two hours or even less, optimum feeding time being 16 to 24 hours. Infection often occurred after 15 minutes' feeding, the optimum time being two hours [cf. 30, p. 219]. Under optimum conditions 10 adults will infect an Amelonado bean. The vectors proved equally effective at all stages of maturity. Mealybugs are still the only known vectors [cf. loc. cit.].

In referring to the classification of the viruses concerned T. W. Tinsley states that there are now believed to be at least two distinct groups attacking cacao in West Africa. Studies of the inter-relationship of virus isolates from different sources continue. Further attempts at mechanical transmission, employing a method used successfully elsewhere with rose mosaic virus [32, p. 314], gave negative results.

A. L. Wharton and S. N. Adams investigated the effect of nitrogen, phosphorus, and potassium on healthy and virus-infected cacao seedlings in water culture. Infection retarded growth, the maximum differences being between plants receiving nitrogen. No treatment markedly affected leaf symptoms of infected plants, and defoliation was correlated with nutrient treatment rather than with virus infection.

Further experimentation with chemical detection of virus infection [33, p. 592] by E. M[argaret] Holden and G. Usher showed that the Tinsley–Usher colour test was unsuited to field application, as certain cacao types gave positive reactions when the trees were not infected by virus. Virus-free leaves with necrotic lesions due to a variety of causes also tended to react positively.

T. W. Tinsley, studying the morbid histology of virus-infected cacao, has found that symptoms in mature leaves result from the failure of young virus-infected tissues to differentiate and the consequent persistence of some juvenile characters. The spongy mesophyll of chlorotic areas lacks spaces.

Investigating resistance and tolerance, W. T. Dale notes that of the cacao types obtained from the Upper Amazon, Inquitos was difficult to infect [31, p. 427] and trials still in progress indicate some degree of resistance in this variety to the New

Juaben strain of the virus. Unless, however, they are highly resistant to infection or possess very low availability of virus to vectors, tolerant trees are merely liable to become not readily detectable reservoirs of infection, menacing more susceptible cacao.

In the section of the report dealing with black pod disease (*Phytophthora palmivora*) (pp. 49–57) A. L. Wharton points out that very considerable damage was caused by rodents (19 per cent. of weekly and 27 of monthly harvested pods in the trial plots at Bunsu), superficial injury affording entry to wound fungi, and suggests that in the past much of this damage has been wrongly attributed to black pod. None of the spraying treatments at Bunsu affected the incidence of damage to pods from various causes, including black pod. Observations led to the conclusion that most proximal black pod infections originate from mycelium of the fungus in the cushions, and are thus unaffected by sprays.

Flück (V.). **Untersuchungen über die Pathogenität von Erregergemischen bei Getreidefußkrankheiten.** [Studies on the pathogenicity of combined agents in cereal foot rots.]—*Phytopath. Z.*, 23, 2, pp. 177–208, 4 figs., 10 graphs. 1955.

At the Federal Technical Institute, Zürich, Switzerland, using a synthetic medium containing aneurin [vitamin B_1], biotin [B_2 group], meso-inositol, and combinations of these growth substances, the author performed inoculation experiments on Huron summer wheat with *Ophiobolus graminis* [*R.A.M.*, 31, p. 58] and *Didymella exitialis* [32, p. 246], originally isolated from barley and wheat, respectively.

The findings of White [20, p. 522] and of Gilpatrick and Henry [29, p. 327] regarding the heterotrophism of *O. graminis* for vitamins B_1 and B_2 were confirmed. On a solid medium vitamin B_2 increases the growth of the runner hyphae but not that of the mycelium. This substance was shown to be largely responsible for the severity of infection by *O. graminis*.

D. exitialis is autotrophic in respect of all three growth substances, which do not enhance its pathogenicity either alone or combined. There was no evidence of mutual antagonism between the two pathogens *in vitro*.

Mixed inoculation invariably resulted in a lowering of the disease index by 15 to 35 or even up to 40 per cent. as compared with *O. graminis* alone. A culture filtrate of *D. exitialis* strongly inhibited the growth of *O. graminis* during a five-day period, and the reduced virulence of the mixed inoculations is attributed in the first instance to the toxic action of the former on the latter species. In tests in which the nutrition of *D. exitialis* was ten times poorer than that of *O. graminis* the disease index of the mixed inoculation was higher than when both pathogens were given a normal food supply. Hence it is inferred that the competitive ability of *D. exitialis* is reduced by insufficient nutrient.

The susceptibility of wheat plants to infection by *O. graminis* declines with age. The reactions of six-day-old seedlings inoculated with this species alone were essentially similar to those of two days in the mixed-inoculation tests. Thus, the reason for the lower disease index of the mixed inoculations as compared with *O. graminis* alone lies in the decreased susceptibility of the seedlings at the very moment when the latter species in the combination becomes actively pathogenic.

Becker (A.). **Beobachtungen über das Auftreten der Federbuschsporenkrankheit in den Jahren 1951–1953 in der Eifel und die Durchführung von Bekämpfungs- und Verhütungsmaßnahmen.** [Observations on the occurrence of the plumed spore disease in the years 1951–53 in the Eifel region and the carrying out of measures of control and prevention.]—*NachrBl. dtsch. PflSchDienst (Braunschw.), Stuttgart*, 7, 6, pp. 100–104, 7 figs., 1955.

An outbreak of twist (*Dilophospora alopecuri*) [*R.A.M.*, 33, p. 427] occurred on

wheat, rye, and silky bent grass [*Agrostis spica-venti*] in a village in the Eifel region of Germany in 1951; the disease was associated with the nematode *Anguina* [*Anguillulina*] *tritici*. Crop losses ranged up to 50 per cent. Only crop rotation gave satisfactory control; dry seed-disinfectants were ineffective. Twist is transmitted through seed and straw and also through the soil from adjacent diseased stands; the pathogen remains viable for over a year. The symptoms of twist on various hosts and nematode injury to seed are illustrated with excellent photographs.

Pugsley (A. T.). **Some aspects of backcrossing for disease resistance in cereals.**—*J. Aust. Inst. agric. Sci.*, 21, 1, pp. 16–20, 1955.

After stating that experience has confirmed the view he expressed some years ago that breeding for disease resistance in wheat, oats, and barley should be based entirely on the back-cross technique, the author discusses the pre-requisites for back-crossing programmes and the application of the method in Australia to stem rust [*Puccinia graminis*: *R.A.M.*, 31, p. 109], leaf rust (*P. triticina*) [cf. 33, p. 342], and bunt [*Tilletia caries* and *T. foetida*: loc. cit.] of wheat, and mildew [*Erysiphe graminis*: 27, p. 561] and covered smut [*Ustilago hordei*: 25, p. 553] of barley.

In 1953, five years after their release, five of 12 samples of wheats originally resistant to stem rust were found to be susceptible. In future, some action will have to be taken to safeguard the identity of resistant back-crossed varieties of wheat. Two possible methods are a seed certification scheme and the incorporation of marker genes as an aid to identification.

A programme has recently been completed by [G. M. E.] Mayo involving the transfer of wheat leaf rust resistance from Kenya C. 6041 [33, p. 289] to a series of South Australia '48' wheats. The derivatives, like the donor parent, are resistant to race 135 AB of leaf rust and to powdery mildew (*E. g. tritici*).

Beke (F.). **Resistance to rust of our Wheat varieties.**—*Agrártud. egy., 1955*, 2, pp. 51–53, 1955.

Statistical analysis of rust (*Puccinia* spp.) damage to wheat in Hungary [*R.A.M.*, 33, p. 716] over a period of 60 years shows that it was serious in 15 per cent. of the years. Bánkuti 1201 and Fleischmann 481 escape injury by early ripening. [This paper also appears in *Hung. agric. Rev.*, 4, 2, pp. 2–3, 1955.]

Pady (S. M.) & Johnston (C. O.). **The concentration of airborne rust spores in relation to epidemiology of Wheat rusts in Kansas in 1954.**—*Plant Dis. Reptr*, 39, 6, pp. 463–466, 1955. [Multilithed.]

Exposure of silicone-coated slides at Manhatten, Kansas, in 1954 showed that spores of wheat stem rust (*Puccinia graminis*) [*R.A.M.*, 35, p. 6] and leaf rust (*P. rubigo-vera* f. sp. *tritici*) [*P. triticina*: loc. cit.] were abundant early in the crop season. The minor epidemic that resulted was checked by the hot, dry weather in the latter half of June, which itself caused some damage to the crop. Conditions during September were favourable for a southward movement of stem rust that resulted in local outbreaks on volunteer wheat. The total crop loss for the State was estimated at 2 per cent. from leaf rust and 2·5 per cent. from stem rust.

Gassner (G.) & Niemann (E.). **Über die Beeinflussung der Sporenkeimung des Zwergsteinbrandes und Roggensteinbrandes durch verschiedene Chemikalien.** [On the influence of various chemicals on spore germination in dwarf bunt and Rye bunt.]—*Phytopath. Z.*, 23, 2, pp. 121–140, 2 figs., 1955.

In addition to information already presented in an abridged account of these studies [*R.A.M.*, 34, p. 357], silver nitrate, ceresan, and lead nitrate are listed among the chemicals promoting sporulation (after an initial set-back) in dwarf bunt of wheat (*Tilletia brevifaciens*) [*T. controversa*] and rye bunt [*T. secalis*] in soil suspension cultures.

Gorter (G. J. M. A.). **Powdery mildew of Wheat.**—*Fmg in S. Afr.*, 30, 351, pp. 281–282, 1 fig., 1955.

The author surveys the available information on the symptoms of powdery mildew (*Erysiphe graminis*) affecting irrigated wheat in the Transvaal and parts of Cape Province [*R.A.M.*, 26, p. 331], its specialized races, methods of control, conditions favouring infection, and varietal reaction to the fungus. The seedling reaction of Union wheats to form S.A.1 of the pathogen is tabulated: Klipkous and Wolkoring are immune and Hope, Kleintrou, Marina, Regent, Rooi Wol, *Tr*[*iticum*] *durum*, and Wolbaard highly resistant.

McNeal (F. H.) & Afanasiev (M. M.). **Transmission of Barley stripe mosaic through the seed in 11 varieties of spring Wheat.**—*Plant Dis. Reptr*, 39, 6, pp. 460–462, 1955. [Multilithed.]

In field trials at Bozeman, Montana, in 1954 all the 11 spring wheat varieties inoculated by the carborundum leaf wiping method with barley false stripe virus [*R.A.M.*, 33, p. 665; 34, p. 631] became infected, the percentage of infection ranging from 19·6 (C.I. 13041) to 94·4 (Rescue). Severe stunting and some sterility were apparent in highly infected varieties. When seed from these inoculated plants was sown in the greenhouse the corresponding range of infection in the 11 varieties was 15·6 to 64·6 per cent. No correlation was established between percentage of disease in the field and germination in the greenhouse but the germination of Pilot and C.I. 13042 was below normal.

Morey (D. D.), Chapman (W. H.), & Earhart (R. W.). **Growing Oats in Florida.**—*Bull. Fla agric. Exp. Sta.* 523, 36 pp., 6 figs., 1953. [Received January, 1956.]

Oat production in Florida is discussed from the aspects of testing varieties for yield, growth characters, and disease resistance, breeding oats specially adapted to Florida conditions, and cultural practices. The symptoms and control of the principal diseases of the crop are indicated on pp. 12–19.

Finkner (R. E.), Atkins (R. E.), & Murphy (H. C.). **Inheritance of resistance to two races of crown rust in Oats.**—*Iowa St. Coll. J. Sci.*, 30, 2, pp. 211–228, 1955.

A full account is given of a study at the Iowa Agricultural Experiment Station, already noticed from a shorter version [*R.A.M.*, 35, p. 96], of the mode of inheritance of reaction to races 57 and 109 of crown rust (*Puccinia coronata*) of oats in three oats crosses. Clinton exhibited only recessive alleles of factors for resistance when tested with race 57. The resistance to race 57 and susceptibility to race 109 of the Ukraine variety was governed by the same gene (MM). One of the duplicate-linked genes (M_1M_1) in Santa Fe was allelic to the MM gene in Ukraine, the latter being dominant.

Wheeler (H. E.) & Luke (H. H.). **Mass screening for disease-resistant mutants in Oats.**—*Science*, 122, 3182, p. 1229, 1 fig., 1955.

In further work at Louisiana State University, Baton Rouge, the toxin produced by cultures of *Helminthosporium victoriae* [*R.A.M.*, 35, p. 10] was used to screen oats for mutants resistant to the disease. Certified seed in 12 bush. lots of Victorgrain 48–93 and Fulgrain, both susceptible to *H. victoriae*, was soaked for 30 minutes in tap water and then spread out in wooden flats to a depth of $\frac{1}{2}$ in. and kept moist. After two days at 27° C. the grain in each flat was drenched with a solution containing 10 units per ml. of *H. victoriae* toxin and returned to 27° for two days more.

The surviving seedlings numbered approximately 50 per bush. Those unaffected by the toxin were classified as resistant, and those injured or stunted, but not killed, as doubtful. All were heavily inoculated with spores and mycelium of *H. victoriae*

and then potted. Counts 30 days later showed that 92 per cent. of the resistant plants were still alive, as against only 8 per cent. of the doubtful.

From a total of 100 bush. (approximately 45,000,000 grains) of oats screened, 973 seedlings survived treatment with the toxin and inoculation with *H. victoriae*. Nearly half the plants (471) proved to be highly susceptible to inoculation with race 45 of crown rust [*Puccinia coronata*] in a rust nursery and were discarded. The whole experiment, including the production of the toxin, took slightly over 800 man-hours.

St. Garay (A.) & Kökényesy (S.). **Vergleichende Untersuchungen über die Keimung der Mutterkorn-Konidien saprophytischen und parasitischen Ursprungs. Experimente mit Antiwirkstoffen.** [Comparative studies on the germination of ergot conidia of saprophytic and parasitic origin. Experiments with anti-metabolites.]—*Phytopath. Z.*, 25, 1, pp. 109–110, 1955. [English summary.]

Honeydew of rye ergot (*Claviceps purpurea*) conidia in laboratory experiments at the Medicinal Plant Research Institute, Budapest, Hungary [see next abstract], was shown to contain chemical compounds that stimulate germination, expedite hyphal growth, and exert a protective action against anti-metabolites.

St. Garay (A.). **Role of ergothioneine and catalase in infection by ergot fungus (Claviceps purpurea Tul.).**—*Nature, Lond.*, 177, 4498, pp. 91–92, 1956.

In further studies at the Research Institute for Medicinal Plants, Budapest, Hungary, hydrogen peroxide at a concentration of 5×10^{-3} *M* completely inhibited the germination of conidia of the rye ergot fungus (*Claviceps purpurea*) [*R.A.M.*, 34, p. 714 and preceding abstract], the reaction being prevented by 5×10^{-3} *M* ergothioneine. The latter alone did not affect germination. Conidia from cultures did not contain ergothioneine but it was present in the conidia-free substances of honeydew. The catalase activity of washed honeydew conidia, known to be more aggressive pathogenetically, and of saprophytic conidia was shown to be weak, but in honeydew sap it was high, 4·54 mgm. hydrogen peroxide being destroyed in five minutes. The addition of honeydew to saprophytic conidia stimulated germination weakly and growth markedly. It appears, therefore, that the presence of ergothioneine and catalase may at least partially account for the fact that honeydew conidia are more aggressive than those of saprophytic origin [8, p. 560].

Hampton (R. O.). **Comparative pathogenicity of Pythiaceous fungi on Corn.**—*Iowa St. Coll. J. Sci.*, 30, 2, pp. 295–299, 1 graph, 1955.

Experiments carried out at the Iowa Agricultural Experiment Station to compare the pathogenicity towards maize of four unidentified isolates of *Pythium* sp., from necrotic maize roots [*R.A.M.*, 34, p. 779], with that of *P. graminicola* and *P. debaryanum*, showed that although varying considerably with changes of moisture, temperature, and host resistance, these isolates were in general more pathogenic to seedlings, and in the case of one of them, to mature plants, than the two known species, and would appear to be potentially just as important pathogens as the latter.

De Carvalho (T.) & Mendes (O.). **Uma nova especie de Cercospora em Citrus sinensis Osbeck.** [A new species of *Cercospora* on *Citrus sinensis* Osbeck.]—*Bol. Soc. broteriana*, Sér. 2, 27, pp. 201–202, 1953.

The species of *Cercospora* already recorded as a pathogen of sweet orange leaves and fruits at Angola, Mozambique [*R.A.M.*, 32, p. 555], does not appear to have been described previously and is accordingly designated *C. angolensis* n. sp. The hypophyllous, densely fasciculate, pluriseptate, light brown, erumpent conidio-

phores, arising from a brown to black, pseudoparenchymatous stroma, measure 27 to 118 by 2·7 to 3·1 μ, and the subclavate, hyaline, mostly straight, 1- to 6-septate conidia 24 to 80 by 3·2 to 6·9 μ.

Chowdhury (S.). **Citrus melanose in Assam and its control.**—*Sci. & Cult.*, 21, 6, pp. 323–325, 1 fig., 1955.

Citrus melanose (*Diaporthe citri*) [C.M.I. map No. 126] is reported to be present in all the citrus-growing tracts in Assam, India, and has so far been noticed on Valencia, Washington navel, Mosambi, Malta Blood Red, shaddock, Seville orange, Mandarin orange, and lemons. Two applications, the first one week after fruit set and the second two to three weeks later, of Bordeaux oil emulsion (3–3–50) or two or three applications of other proprietary copper fungicides materially prevented fruit injury in trials over several years.

Levitt (E. C.). **Renovation of Citrus trees.**—*Agric. Gaz. N.S.W.*, 65, 7, pp. 343–348, 4 figs.; 8, pp. 432–439, 8 figs., 1955.

In the first part of this paper reference is made to citrus diseases and especially to viruses. The causes of decline of citrus trees in New South Wales, due to root rot (*Phytophthora* [spp.]), viruses [see above, p. 354] and inadequate manuring, are reviewed in the light of possible improvement. The unknown virus disease affecting Ellendale and Imperial [? Emperor: 32, p. 77] mandarins on rough lemon stock induces no symptoms on sweet orange or [*Poncirus*] *trifoliata* rootstock. Recommendations include the removal and replacement of trees stunted by scaly butt virus [34, pp. 295–296] as soon as the symptom is recognized. The shell bark virus [32, p. 77] may be combated by irrigation in dry weather and ample fertilizing, which will keep the trees in production for 20 to 25 years, when replacement should be considered, but psorosis or scaly bark [34, p. 296] is not amenable to treatment.

Baxter (P.) & Belcher (R.). **The role of the bicarbonate ion in lime induced chlorosis.**—*J. Aust. Inst. agric. Sci.*, 21, 1, pp. 32–34, 1955.

In work at the Horticultural Division, Department of Agriculture, Melbourne, and at the State Laboratories, Melbourne, on lime-induced iron deficiency in citrus [cf. *R.A.M.*, 31, p. 297; 35, p. 98] the hydrogen ion concentration of the root sap of orange trees growing in alkaline soil was found to be lower than that of trees in acid soil; where the soil contained lime there was a further decrease. Roots of trees deficient in iron had the highest internal pH. The root sap of chlorotic trees and, to a less extent, that of healthy trees on calcareous soil had a high buffer capacity in the range pH 6·2 to 6·4, indicating accumulation of bicarbonate, which was confirmed by chemical analysis. Roots of chlorotic trees contained more calcium and carbonate than those of healthy trees on similar soil. It is suggested that the toxic effects of the internal accumulation of bicarbonate on carbon-dioxide excretion, accompanied by a rise in the internal pH, are probably the main factors in the general metabolic disturbance associated with the symptoms of iron deficiency in plants.

Schneider (H.). **Decline of Lemon trees on Sour Orange rootstock.**—*Calif. Citrogr.*, 41, 3, pp. 117–120, 3 figs., 1956.

A study of sour orange root stock necrosis of lemon trees, a disease that affects certain lemon strains on sour orange when about 12 to 15 years old, was made at the University of California Citrus Experiment Station [cf. *R.A.M.*, 34, p. 640]. Macroscopic symptoms on the cambial face of bark and wood, immediately below the bud union, may take the form of jagged brown lines, whitish raised areas, or pin-holes. Microscopic symptoms in the same area are necrosis of the sieve tubes,

and sometimes abnormal enlargement of parenchyma cells, together with excessive sheets of fibres and enlargement of the rays. The disease appears to be distinct from lemon sieve-tube necrosis [cf. 31, p. 432], and whereas the onset of the latter may begin long before it causes decline, rootstock necrosis is not always detectable in advance as its onset is closely followed by decline.

It is suggested that a substance not toxic to lemon bark moves across the bud union and causes the necrosis of the sour orange sieve tubes. Some lemon strains, including Limoneira, Open Lisbon, and Allen Eureka, are apparently less compatible with sour orange than others, such as Price and Rosenberger Lisbons. The occurrence of the disorder is somewhat erratic, as is shown by tabulated records (of samples taken over three years in a number of groups of trees) of the condition of the phloem of sour orange rootstock bearing a variety of different lemon strain scions.

Smith (P. F.). **Boron deficiency in Florida Citrus groves.**—*Proc. Fla hort. Soc.*, 67 (*1954*), pp. 69–73, 2 figs., 1955.

Several hundred acres of young citrus trees on sweet and sour orange stocks in central Florida were affected by fruit gumming and shed an excessive proportion of the young fruits. The foliage was pale with a very low boron content [*R.A.M.*, 31, p. 542], but the cupped, corky-veined, or yellow-veined leaves associated with boron deficiency were few and defoliation was not excessive. These observations indicate that boron deficiency in citrus may markedly reduce production even in the absence of clearly defined leaf symptoms.

Nutman (F. J.) & Roberts (F[lorence] M.). **Frond-drop. A note on an abnormal condition of Coconut Palms in Jamaica.**—*Emp. J. exp. Agric.*, 23, 91–92, pp. 268–270, 2 pl., 1955.

A widespread abnormal condition of coco-nut palms in Jamaica first becomes evident by the premature drooping of the fronds [? false wilt: cf. *R.A.M.*, 19, p. 531; 24, p. 367]; eventually the growing point dies, leaving the trunk covered with drooping brown fronds. During the course of the disease the inflorescences become progressively smaller and set fewer nuts, which are often misshapen. Frond-drop occurs in coco-nuts growing in varied soil conditions and no bacterial or fungal pathogen has been found in diseased tissue. It is suggested that frond-drop is due to a virus in view of the epidemiology of the disease and the occurrence of binucleate cells in the leaves of affected plants.

Nutman (F. J.) & Roberts (F[lorence] M.). **Lethal yellowing : the 'unknown disease' of Coconut Palms in Jamaica.**—*Emp. J. exp. Agric.*, 23, 91–92, pp. 257–267, 3 pl. (1 col.), 4 maps, 1955.

All attempts to find a fungal or bacterial pathogen responsible for lethal yellowing (formerly called the 'unknown disease' [*R.A.M.*, 35, p. 181]) of coco-nuts in the Caribbean area have been fruitless. Epidemiological data, symptoms, the occurrence of double nuclei in the cells of affected palms, and positive serological reactions indicate that the disease may be due to a virus. The use of resistant varieties, of which Malayan Dwarf is already available, offers the only practicable method of control.

Second Annual Report of the West African Institute for Oil Palm Research, 1953–1954.—99 pp., 1 map, [? 1954. Received 1955].

The section of this report [cf. *R.A.M.*, 35, p. 13] covering plant pathology (pp. 78–85) deals mainly with seedling diseases and deficiency disorders of mature oil palms. Eelworms did not appear to be the cause of blast of seedlings, but there was some indication that a species of *Pythium* might be damaging the roots of affected

plants. Nursery surveys indicated that blast occurs mostly in the early part of the dry season and that the number of seedlings affected or killed is lower than previously assumed. A detailed survey of 754 seedlings showed that 11 per cent. were lost through disease, of which blast accounted for 5·2, anthracnose for 5·3, freckle [associated with *Cercospora elaeidis*: 34, p. 720] for 0·4, and insect damage for 0·3, in addition to which 18 per cent. could not be transplanted owing to various other causes. These results show that, as a nursery disease, anthracnose may equal blast in importance.

The results of investigations of the orange frond disease have been noticed from another source [loc. cit.].

Peat (J. E.), Munro (J. M.), & Arnold (M. H.). **Tanganyika Territory, Lake Province. Progress Report for the season 1953–54.**—24 pp., 2 graphs, London, Empire Cotton Growing Corporation, 1955.

Diseases are dealt with on pp. 17–20 of this report [cf. *R.A.M.*, 32, p. 376]. In a trial carried out at the Cotton Experiment Station, Lake Province, Tanganyika Territory, during 1953–54, in a field which had not carried cotton for at least five seasons, seed treatment against bacterial blight (*Xanthomonas malvacearum*) [see next abstract] gave a mean increase in yield of 177 lb. per acre of seed cotton, or 25 per cent. The treatment did not affect the proportion of stained (Grade C) seed cotton. In a second trial, in a field where cotton had been grown for the previous four seasons and had sustained moderate to severe attacks of blight, the mean increase in yield brought about by seed treatment was 126 lb. per acre of seed cotton, or 29 per cent. Information obtained during the season on the occurrence of trash infection was inconclusive. In a third trial, on land under grass rested for four years previously, trash known to be heavily infected with *X. malvacearum* was applied to half the plots. Six weeks after emergence there was no increase in stem or leaf lesions in the trash-treated plots, as compared with those not given trash; furthermore, the trash had no effect on yield. The mean increase in yield due to the seed treatment was 99 lb. of seed cotton per acre, equivalent to an increase of 8 per cent. on the mean yield of the untreated seed, which was 1,230 lb. per acre. These results show that seed treatment gave a worth-while increase in yield in both rotated and trash-infested land, and indicate that under the seasonal conditions obtaining seed-borne infection was more important than that arising from trash.

Plants of UK48 affected by wilt (*Fusarium oxysporum* f. *vasinfectum*) [*F. vasinfectum*] were discovered in native holdings over an area of about a quarter of a square mile on lake shore sand in Geita district.

Hutchinson (J. B.). **Survey of Progress Reports for the season 1953–54.**—13 pp., London, Empire Cotton Growing Corporation, 1955.

It is stated (p. 5) that in the last few years the dusting of cotton seed against seed-borne infections with a copper compound in batch mixers has been extended progressively in Uganda [cf. *R.A.M.*, 34, p. 645]. In 1953–4 all the seed issued in Kenya and Aden and nearly half that issued in Lake Province, Tanganyika, was dusted. Experimental evidence has also demonstrated that seed treatment is a worth-while insurance against bad attacks of bacterial blight [*Xanthomonas malvacearum*: see preceding abstract] in Northern Nigeria and Nyasaland.

Deshpande (R. B.) & Jeswani (L. M.). **Inheritance of resistance to wilt (Fusarium lini Bolley) in Linseed.**—*Curr. Sci.*, 24, 6, pp. 202–203, 1955.

Studies carried out at the Indian Agricultural Research Institute, New Delhi, indicate that resistance to wilt (*Fusarium lini*) in flax [*R.A.M.*, 32, p. 544] is inherited, resistance being dominant over susceptibility.

JENKINS (ANNA E.). **Notes on spot anthracnose and related subjects VI. Some new distribution records.**—*Plant Dis. Reptr*, 39, 6, pp. 516–517, 1955. [Multilithed.]

Additional information is given on the distribution of *Elsinoe mattirolianum* on *Arbutus unedo*, *E. parthenocissi* on *Parthenocissus quinquefolia* and its var. *saint-paulii*, and *Sphaceloma rosarum* on rose [*R.A.M.*, 31, p. 185].

MAGIE (R. O.). **Stromatinia disease of Gladiolus.**—*Proc. Fla hort. Soc.*, 67 (*1954*), pp. 313–317, 1 fig., 1955.

The most severe losses from neck and root rot (*Stromatinia* [*Sclerotinia*] *gladioli*) of gladiolus [cf. *R.A.M.*, 34, p. 788] on the west coast of Florida have occurred in fields planted with this crop for the second or third time in succession. Even on recently cleared land this practice should not be carried out. Older fields may, apparently, be planted with gladiolus every fourth year; in the intervening years the growth of volunteers should be kept down by disking. Fields to be planted in winter should be kept clear of volunteers in autumn. If the soil is infested, or diseased corms are used, plantings should be made before 1st September or after 1st January. Those made in October, November, and December should be kept dry.

Large and 'jumbo' corms should be cured by heat, if necessary, and cleaned as soon as possible after lifting. Four to 18 hours later they should be soaked for 30 minutes in dowicide B (1½ lb. in 50 gals. water plus ½ cup of wetting agent). Just before planting the corms should be dipped for one minute in N.I. ceresan solution (1–50–½) or, if not treated after lifting, soaked for 30 minutes in dowicide B (3–50–½).

Medium and small corms should be soaked for 30 minutes in dowicide B (1–50–½) within four to six hours after removal of the mother corms and dipped in N.I. ceresan just before planting, or if not treated after lifting, soaked for 10 to 15 minutes in N.I. ceresan.

A satisfactory reduction of the neck rot phase was obtained on a fine-sand soil by disking in 1,500 lb. of calcium cyanamide per acre at least 60 days before planting.

MAGIE (R. O.). **Gladiolus corm treatments in the control of Fusarium rot.**—*Proc. Fla hort. Soc.*, 66 (*1953*), pp. 318–321, 1954.

In field experiments conducted in Florida on the control of gladiolus corm rot (*Fusarium oxysporum* f. *gladioli*) [*R.A.M.*, 34, pp. 236, 787] chemotherapeutants and antibiotics were applied to naturally infected Picardy corms and cormlets by methods designed to force the fungicides into the vascular tissues. Cormlets from diseased corms were soaked in water for 24 hours and then placed in a fungicidal solution for 30 minutes, during one minute of which a vacuum of 22 lb. was maintained. Planting was carried out ten days later. Good control was given by 0·25 per cent. streptothricin HCl and by 0·08 per cent. vancide F845 emulsified (dibromo diethyl malonate), but the treatments failed to eliminate latent infections.

Treatment in which fungicides were made to adhere to the corms by thickening with methylcellulose gave good control with 0·8 per cent. solution of experimental chemotherapeutant No. 1207 (2-norcamphanemethanol) and 0·1 per cent. solution of No. 1182 (4-chloro-3, 5-dimethylphenoxyethanol), but when these and other fungicides were adsorbed on activated charcoal and placed in the planting-furrow control was poor.

Soaking the corms for three days before planting gave good control when 0·02 per cent. solution of crag 974 (3,5-dimethyltetrahydro–1,3,5,2 H-thio-diazine-2-thione) and orthocide 50 wettable (captan) 0·5 per cent. were used. The latter caused stunting.

When whole plants of old Picardy stock were placed upright for three hours in shallow pans containing fungicidal solutions promising control was given by 0·05

per cent. vancide F845, 0·01 per cent. CP 4367 (2,2′,2″,-nitrilotriethanol pentachloro-phenoxyacetate), and 1 gm. phygon XL in 10 ml. ethanol diluted with 30 l. of water. Whether latent infections were eliminated by these treatments was not determined, but the results are such as to encourage further research with chemotherapeutants and antibiotics.

While corm treatment is often helpful in the control of *F. oxysporum* f. *gladioli*, maintaining healthy corm stocks is more important. A few growers have discontinued treatment without loss of production. Heavy losses are avoided by replacing stocks every three or four years with healthy corms grown from planting stock, planting cover crops in two out of three years, and using resistant varieties.

Gäumann (E.). **Über den Wirtswechsel der Puccinia iridis (D.C.) Wallr.** [On host alternation in *Puccinia iridis* (D.C.) Wallr.] —*Phytopath. Z.*, 25, 1, pp. 99–102, 1955.

Inoculation experiments with *Puccinia iridis*, collected on *Iris graminea* in the canton of Ticino, Switzerland, resulted in the production of abundant spermogonia on *Urtica dioica* [*R.A.M.*, 29, p. 216] and *U. urens*, aecidiospores from which caused severe infection on *I. graminea*. On the other hand, negative results were obtained on *Parietaria officinalis* and *Valeriana officinalis*. Since no full description of the spermogonia and aecidia on *U.* spp. has yet appeared in the literature, a diagnosis is presented. The circular, immersed spermogonia, 80 to 140 μ in diameter, with projecting ostiolar periphyses, develop in small groups, mostly on the upper leaf surface. The aecidia occur, also in small groups, principally on the under side. The cells of the cup-shaped, white pseudoperidium, disposed in relatively loose but distinct longitudinal rows, are often almost square, more rarely rectangular or hexagonal, and measure 16 to 21 μ. The roughly circular, oblong, or polyhedric, concatenate aecidiospores measure 11 to 24 by 10 to 18 (mostly 15 to 20 by 12 to 16) μ. The aecidia of *P. iridis* differ from those of *P. urticae-caricis* [*P. caricina*] on the same two *U.* spp. principally in the thickness of the pseudoperidial cell walls; in the former the inner wall measures 2 to 3 μ and the outer 1 to 2 μ, whereas in the latter the outer is thicker than the inner (up to 7 as against 3 to 5 μ).

Discussing the relationship between the Swiss form of *P. iridis* on *I. graminea* and the Norwegian on *I. sibirica* [loc. cit.], the author concludes that they are identical as regards morphology but biologically distinct, both being specialized on their own hosts.

Jacks (H.), Webb (A. J.), & Hunter (J. A.). **Black spot of Roses. Modern methods of control.**—*N.Z. Gdnr*, 12, 1, pp. 259–261, 1955.

At the Plant Diseases Division, Auckland, New Zealand, the rose varieties Shot Silk, Autumn, and Peace were used in fungicide trials from 1951 to 1955, inclusive, for the control of black spot (*Diplocarpon rosae*) [*R.A.M.*, 33, p. 308], which is particularly troublesome in New Zealand. In general, the degree of infection varied with the season, being lowest in 1953–4 when six applications of thirospray (50 per cent. thiram wettable powder, 2 lb. per 100 gals.) alone significantly reduced average leaf infection from 11·5 per cent. in the untreated to 1·8 per cent. In 1952–3 five applications of colsul 40 (40 per cent. colloidal sulphur paste, 4 lb.) alone gave significant reduction, with an average of 28·8 per cent. infected leaves as against 58 per cent. for the control, while in 1954–5 six applications of colsul 40, ascospray (2 per cent. phenyl mercury chloride), dithane Z-78 (65 per cent. zineb), flit 406 and orthocide 50 (both 50 per cent. captan), fuclasin ultra (70 per cent. ziram), and thirospray effectively reduced infection from 70 per cent. (control) to 11, 15·1, 11·1, 18·8, 12·1, 5·9, and 23 per cent., respectively.

White (H. E.). **Response of Roses and Gardenias to treatment with chelated iron and a chelating agent.**—*Proc. Amer. Soc. hort. Sci.*, 64, pp. 423–430, 4 figs., 1954. [Received June, 1955.]

At the University of Massachusetts, Amherst, iron chlorosis of greenhouse-grown roses and gardenias disappeared following soil applications of dry mono-sodium ferriethylenediamine tetra acetate dihydrate (4 to 24 oz. per 100 sq. ft.) [*R.A.M.*, 35, p. 41] in three to seven weeks. Foliar sprays of iron chelate (2 lb. in 100 gals.) injured roses but not gardenias. Good responses were obtained to soil applications of the chelating agent trisodium ethylenediamine tetra-acetate.

White (N. H.) & Goodchild (D. J.). **Mosaic or black streak disease of Cymbidium and other Orchid hybrids.**—*J. Aust. Inst. agric. Sci.*, 21, 1, pp. 36–38, 1 fig., 1955.

At the Plant Pathology Laboratories, University of Sydney, sap transmissions from a *Cymbidium* plant affected by mosaic or black streak, as described by Jensen [*R.A.M.*, 30, p. 469 *et passim*], reproduced the symptoms on healthy plants; on *Datura stramonium* small, necrotic, local lesions developed in about ten days. The thermal inactivation point of the virus was between 65° and 70° C. These data are considered to confirm Jensen's view that the disease described by Magee is the same as that affecting *Cymbidium* in America [loc. cit.]

Hartwich (W.). **Untersuchungen über die Entwicklung des Uromyces pisi (DC.) Otth auf Euphorbia cyparissias L.** [Studies on the development of *Uromyces pisi* (DC.) Otth on *Euphorbia cyparissias* L.]—*Phytopath. Z.*, 24, 1, pp. 73–96, 2 figs., 4 graphs, 1955.

At the Botanical Institute of the Technical College, Brunswick, Germany, inoculation experiments on rhizomes and aerial shoots of *Euphorbia cyparissias* with overwintered teleutospores of *Uromyces pisi* [*R.A.M.*, 29, p. 242] from *Lotus corniculatus*, vetch (*Vicia cracca*), *Lathyrus pratensis*, *Astragalus glycyphyllus*, and *Medicago lupulina* between April, 1952, and March, 1953, yielded the following information. The incubation period under natural conditions is one year, but it may be terminated in the late autumn by forcing the production of shoots. The path of infection is absolutely restricted to the underground rhizome buds. Attempts in the greenhouse to curtail or extend the duration and scope of the acute phase of the disease by a modification in the growth rate of the inoculated germinating shoots failed because of the confinement of infection to the leaves pre-formed in the winter buds. Pycnial production in the leaves proceeds independently of the growth rate of the shoots. In an experiment designed to influence the growth of inoculated shoots by differential illumination the expected etiolation was realized only in total darkness.

A comparative study of the development of healthy and diseased buds and shoots of *E. cyparissias* showed that full infection of the host tissue is practicable solely in the resting bud because the mycelium develops so slowly. Forcing interrupts the process of infection, and the intensity of the symptoms on the fully grown shoot reflects the grade of pathogenicity attained in the bud at the time. There was no difference between healthy and diseased buds as regards the rhythm of development.

Three phases are differentiated in the course of this disease. In the first place the parasitic mycelium infects the slowly developing buds at the embryo stage, advancing to colonize the leaf primordia, permeating them completely, influencing them formatively, and causing them to open to serve as a nutrient medium for the pycnia. Secondly, on the production of the shoots the rust fructifies in the long pre-formed and infected leaves. On the other hand, the hyphae are ruptured in the rapidly elongated stems. In the final phase, after the unfolding of all the leaves

initiated and infected in the winter buds, the shoots begin to outgrow the rust with the production of new stem parts and leaves, escaping further attacks through accelerated growth and shedding the diseased foliage.

Mead (H. W.). **The effect of fungicides on seedling diseases of legumes and grasses in Saskatchewan.**—*Canad. J. agric. Sci.*, 35, 4, pp. 329–336, 1955.

At the Plant Pathology Laboratory, Saskatoon, Saskatchewan, seeds of legumes and grasses were treated for the control of damping-off, responsible for irregular stands in the Province, and caused by various fungi including *Pythium debaryanum* [*R.A.M.*, 35, p. 102], *Rhizoctonia* [*Corticium*] *solani* [loc. cit., 33, p. 729], *Fusarium avenaceum* [34, p. 258], *F. acuminatum* [loc. cit.], *F. culmorum* [loc. cit.], and *Ascochyta imperfecta* [34, p. 459; 35, p. 102]. In the greenhouse experiments with sterilized soil inoculated with *F. culmorum*, stands of lucerne, sweet clover [*Melilotus* spp.], and red clover from both good and poor (germination below 80 per cent.) seed, and of crested wheat grass [*Agropyron cristatum*] from poor seed were increased by arasan applied at 0·5 per cent. seed weight. In most experiments with naturally infested soil seed treatments improved the stand of legumes but not of grasses, arasan resulting in significant increases in six out of 14 trials on legume seed. Orthocide 75 and orthocide 406, both containing captan, proved beneficial to lucerne and clovers in one experiment.

In the field arasan increased the number of healthy seedlings and the total number of seedlings of sweet clover and reduced the amount of seed decay, but did not prevent lesions on the young seedlings due to soil fungi. There was little difference among the fungicides in their effect on legumes, semesan and captan being slightly better than the others. The non-mercurials, the least toxic to nitrifying bacteria, are regarded as best for legume seed. Of the newer fungicides, captan compounds were effective on both legumes and grasses. Post-emergence blighting was not prevented by any of the treatments.

Peto (D. H.). **Another occurrence of Cocksfoot streak, a virus disease of Dactylis glomerata L.**—*J. Brit. Grassl. Soc.*, 10, 2, pp. 193–194, 1 fig., 1955.

Cocksfoot streak virus [*R.A.M.*, 32, p. 630] was recorded for the second time in England on *Dactylis glomerata* at the Plant Breeding Institute, Cambridge, in the autumn of 1954. The apparent rarity of the disease is ascribed to the difficulty of recognizing symptoms in the early stages of infection.

Benedict (W. G.). **A ring spot virus in Red Clover in Ontario.**—*Plant. Dis. Reptr*, 39, 6, pp. 457–459, 2 figs., 1955. [Multilithed.]

A virus believed to be a strain of tobacco ring spot [*R.A.M.*, 7, p. 478] infected red clover in Ontario, Canada, in 1954. The disease was most common in second year stands, affecting 75 to 90 per cent. of the plants in some fields. The symptoms closely resembled those of the virus disease similar to ring spot described by E. E. Johnson [13, p. 101], but in the present studies the virus was readily transmitted mechanically to tobacco and bean [*Phaseolus vulgaris*]. Although infection of whole fields in Ontario suggested that some vector was involved, none was found.

Gorz (H. J.). **Inheritance of reaction to Ascochyta caulicola in Sweetclover (Melilotus alba).**—*Agron. J.*, 47, 8, pp. 379–383, 1955.

Stem canker or goose-neck disease of sweet clover caused by *Ascochyta caulicola* [*R.A.M.*, 18, p. 35] has become prevalent in the north central States of America since 1946 and is now considered to be one of the major diseases of the crop in this region. The high incidence of susceptibility and lack of progress in the random selection of resistant plants prompted the following co-operative investigations between the Field Crops Research Branch, United States Department of Agricul-

ture, and the Departments of Genetics and Agronomy, University of Wisconsin. The interacting gene pairs *Ee* and *Gg* were found to govern inheritance of reaction to *A. caulicola*, gene *G*, dominant for susceptibility, acting only in the absence of the epistatic *E*, dominant for resistance. Plants having the homozygous recessive genotype *eegg* were resistant since dominant *G* is necessary for susceptibility, but the resistance was apparently less effective under optimum conditions than that controlled by *E*. Susceptibility may be eliminated in breeding lines by crossing plants of unknown genotype to homozygous susceptible tester plants containing a recessive marker to eliminate selfs. The absence of susceptibility in seven to ten F_1 plants would reveal the presence of the resistant *EE* genotype which would maintain resistance in the progeny of plants in a cross- or self-pollinated nursery.

Battle (W. R.), Ribaldi (M.), & Panella (A.). **Avvizzimento batterico dei Medicai italiani.** [Bacterial wilt of Italian Lucerne.]—Reprinted from *G. Agric., Jesi, 1955*, 30, 3 pp., 2 figs., 1955.

In the winter of 1955 lucerne plants growing on irrigated land in the province of Verona, Italy, were affected by a wilt, apparently of bacterial origin. The disease was later found under similar conditions in Umbria, Tuscany, and the Marches, while in the Topino Valley, Umbria, it was present on unirrigated soil. It was also widespread in Sicily and Apulia.

The first symptom is a wilting of the stem apices during the hottest part of the day. Subsequently the leaves gradually turn yellow and remain small and twisted; the growth of the whole plant slows down, and the roots show the presence of yellow-brown streaks, which gradually widen and invade all the tissues. One-year-old seedlings may become affected, but the diseased plants are mostly those in their second or third year.

From the symptoms observed the authors conclude that the condition is probably due to *Xanthomonas* [? *Pseudomonas*] *radiciperda* [cf. *R.A.M.*, 11, p. 653] or *Corynebacterium insidiosum* [cf. 34, p. 791], or both. Further investigation is in progress.

Baumann (G.) & Klinkowski (M.). **Ein Beitrag zur Analyse der Obstvirosen des mitteldeutschen Raumes.** [A contribution to the analysis of the fruit viroses of the central German region.]—*Phytopath Z.*, 25, 1, pp. 55–71, 17 figs., 1 map, 1955.

This is a report of the observations made during the first two years of an investigation into the fruit viroses of central Germany. Apple mosaic virus [see next abstracts], already reported from the north-west [*R.A.M.*, 34, p. 80] where it is known as 'Jonathan mosaic' and affects chiefly Golden Delicious, Gravenstein, Jonathan, and Cox's Orange, was found only on the English variety, Lady Sudeley, and the hybrid 75B5225 Oldenburg.

A brilliant yellow band mosaic occurring on a Mayflower peach was transmitted by bud-grafting in August to two-year-old peach seedlings, which developed characteristic symptoms in the following spring. By means of 'chip-grafting' [34, p. 41] it was further transmitted to peach seedlings just as growth recommenced, resulting in the development of symptoms some four weeks later. Two-year-old *Prunus cerasifera* var. *myrobalana* and apricot seedlings reacted to the same method of inoculation by faint chlorosis without definite band mosaic symptoms. Further studies are planned to determine the possible identity of the disease with peach line-pattern [virosis], recently reported from Holland [see next abstract]. There is considered to be no doubt that the band mosaic of plums occurring throughout the area under inspection [34, p. 80] is the same as peach line-pattern virosis. It has also previously been reported from Mecklenburg on the Blaue Hauspflaume, Wangenheim, and Emma Leppermann varieties (*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 8, pp. 48–50, 1954). The two first-named were also

found to be infected in central Germany, together with Wolmirstedt (used as a rootstock), Nancy Mirabelle, Gerstetter, and Bühlers Frühzwetsche.

The economic importance of the virosis is still uncertain, but severe attacks, e.g., on the susceptible Nancy Mirabelle, may reduce leaf and shoot development. Stringent selection should therefore be practised in nurseries during the summer to prevent the spread of the virus by means of infected root-stocks or scions. Band mosaic has been observed in the Harz Mountains on the leaves of wild *P. spinosa*, which may well serve as a reservoir of infection.

Cherry ring spot virus is prevalent all over central Germany [*R.A.M.*, 34, p. 80]. Details are given of the successful transmission by budding or chip-grafting of three strains of the virus to Mazzard cherry (*P. avium*), peach, and a three-year-old Hedelfinger sweet cherry selection.

The hitherto undescribed Stecklenberg disease of sour cherries, named after its principal focus on the northern periphery of the Harz, is of great economic importance. In 10- to 15-year-old plantings there was 70 to 80 per cent. infection and about 5 per cent. of the trees died during the period of observation. In older trees the current-season shoot growth is greatly reduced, the average length, based on 200 measurements, being 5·3 cm. on diseased as compared with 10·5 on healthy trees. In very severe cases the only new growth consists of a terminal rosette with six or eight buds. The leaves are abnormally small and narrow, of a leathery texture, and mostly presenting a greasy appearance. The margins may be arched towards the middle and upwards. On dying trees only a few tufts of livid grey-green leaves are left adhering to the compressed and thickened shoots. Foliar symptoms in the form of brown or red-brown rings and spots appear first on the basal leaves of current-season shoots or the lateral shoots of older wood: the subsequent rupture of the lesions imparts a shot-hole aspect. As a rule, the following leaves develop a partial green to yellowish speckle, sometimes enclosing dark green or yellowish, frequently zonate ring spots, which persists until the end of the growing period. Characteristic of the Stecklenberg disease is the formation of leaflet-shaped enations in the intercostal areas of the under side of the leaf, mostly near the margin in the central to upper part. They are usually confined to a few leaves and do not occur every year. The 'shock effect' associated with viruses of the ring spot group, in which intensive symptom expression is followed by a period—sometimes protracted—of more or less complete masking, appears to be also a feature of the Stecklenberg disease. Abortion of the flower buds, commonly attributed to frost damage, is another direct or indirect effect of the virosis. In many cases sour cherry stocks present distinct symptoms of a virus infection in the form of yellow spots or bands (as in *P. mahaleb*) or a faint yellow leaf mottle with more or less numerous necroses (Mazzard cherry). Here too only the oldest leaves are affected. Besides the widely grown Schattenmorelle, the Diemitzer and Königliche Amarelle, Leitzkauer, Nordmann, Koröser, and Pandys varieties and a Russian sour cherry stock are susceptible to the virosis, which is equally severe on eight or ten and 15- to 20-year-old trees. Infection was transmitted by budding and chip-grafting to two- and three-year-old Schattenmorelle sour cherry and peach seedlings. Sap inoculation experiments on Delikatess cucumber seedlings were also successful [cf. 35, p. 304], reactions to the virus developing after six to eight days and including chlorotic or ring spots on the cotyledons, and vein-clearing, spotting, and malformations of the first true leaf, often followed 10 to 12 days after inoculation by death of the growing point.

The Stecklenberg virosis presents certain analogies with the cherry necrotic ring spot of the United States and the form of the same disease recently reported from Holland [34, p. 654]. The first may be differentiated, however, by the presence of symptoms throughout the summer on the young leaves of the spring shoots and by the formation of enations. For the present the German disease is presumed to

be due to a special form of the cherry necrotic ring spot virus or to a complex with the latter as one of its components.

Van Katwijk (W.). **Virusziekten in de vruchtboomwekerij.** [Virus diseases in the fruit tree nursery.]—*Versl. PlZiekt. Dienst Wageningen* 119, 27 pp., 35 figs., 1953.

The symptoms and modes of transmission of the following viroses affecting fruits in Holland are described: apple mosaic, rubbery wood, and proliferation disease [see next abstract]; pear mosaic and stony pit; Eckelrade disease [loc. cit.] and rasp leaf of cherry, the latter occurring also on plum and peach; peach line-pattern virosis virus [see preceding abstract] of plum, peach, almond, and apricot; mosaic and *Rubus* stunt virus [*R.A.M.*, 33, p. 541] of raspberry and blackberry; mosaic of red and black currants and gooseberry, reversion of black currants, and spoon leaf of red currants. The last-named, found principally on the Fay's Prolific variety, caused localized subnormal growth of red currant leaves, resulting in cavities and the development of a spoon shape. The indentations in the lobes are less deep and fewer than in normal leaves, and in severe cases the margin may be almost circular or even quite misshapen; fertility is also reduced.

Brief directions are given for the control of the individual viroses and a concluding section contains general recommendations for the selection of mother plants, disinfection of stocks and scions, extermination of insects and nursery hygiene, and the isolation of elite plots, e.g., of raspberries, which must be at least 100 m. distant from plots graded AA or A and 250 m. from other raspberry plants, and black currants to be situated at least 25 m. away from a plot infested by black currant gall mite [*Phytoptus ribis*] and 10 m. from one affected by reversion.

Mulder (D.). **Het eerste symposium over virusziekten van vruchtbomen in Europa te Wädenswil (Zwitserland).** [The first symposium on virus diseases of fruit trees in Europe at Wädenswil (Switzerland).]—*Meded. Dir. Tuinb.*, 18, 7, pp. 446–448, 1955. [English summary.]

In an introductory speech at the above-mentioned symposium [H.] Blumer defined the two problems to be considered as follows: (1) the identity of European and American fruit viroses, necessitating cross-transmission experiments; and (2) the urgent need for the assay of nursery products and mother trees for virus diseases, entailing the development of a rapid method of testing.

Of the various diseases mentioned by L. C. Cochran (Riverside, California) and M. F. Welsh (Summerland, Canada), only peach wart [*R.A.M.*, 33, p. 734], prune [plum] dwarf [33, p. 95], and sweet cherry ring spot [see preceding abstract] occur in Europe.

C. A. R. Meijneke (Wageningen) reported the rapid spread of the Eckelrade [Pfeffinger] disease of sweet cherries in Holland between 1950 and 1953 [31, p. 128.]

W. Kotte (Freiburg) reviewed his observations in south-west Germany, where Pfeffinger disease [34, p. 80] has been present since 1947 and apple mosaic [see preceding abstract] is extending its range, especially on Beauty of Boskoop in old orchards. Strawberry and raspberry viroses are also becoming increasingly troublesome.

H. Thiem (Heidelberg) described various symptoms of fruit tree 'degeneration' of unspecified origin.

General information on the production of virus-free planting material was presented by G. L. Stout (Sacramento, California).

Among the viroses listed by R. Ciferri (Pavia) as occurring in Italy was apple witches' broom or proliferation disease [35, p. 196, and above, p. 350], an account of which was given by D. Mulder. The same speaker also described a new disease of May cherries which is apparently identical with necrotic ring spot [34, p. 654].

The inoculation of May cherry trees with material from a sweet cherry affected by Pfeffinger disease caused the development of ring spot in the former. Hence it is concluded that necrotic ring spot is one of the components of the Pfeffinger virus complex.

In experiments at Berlin-Dahlem, K. Heinze succeeded in transmitting peach mosaic virus by means of *Myzodes* [*Myzus*] *persicae* and *Hyalopterus amygdali*.

The contribution of R. Gallay (Lausanne) dealt with infectious degeneration [court-noué] of the vine [35, p. 271]. Some of the many divergent symptoms comprised under this heading, e.g., vein-clearing, mosaic, and chlorosis, appear to be communicable by grafting to healthy plants, while seed transmission is also indicated for vein-clearing and crinkle. A method devised by [W.] Wurgler for the diagnosis of court-noué is based on the fact that diseased stocks form fewer and larger roots than healthy ones. In R. Bovey's experiments on the cure of infected potted vines by heat treatment, the symptoms on some of the plants disappeared but returned later in an aggravated form.

The last-named speaker discussed the position with regard to strawberry viroses [see below, p. 377] in the vicinity of Lausanne, where the presence of crinkle and yellow edge has been demonstrated. Other [unidentified] viruses are responsible for proliferation, vein-clearing, and chlorosis in *Fragaria vesca*. Virus-free material is being propagated at high altitudes in the Rhone Valley, where the principal vector, *Pentatrichopus fragaefolii*, is virtually absent.

Mirić (Mirjana). **Ispitivanja efikasnosti duphara u suzbijanju čađave krastavosti Jabuka.** [Testing the effectiveness of duphar in the control of Apple scab.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1955*, 29, pp. 67–73, 1955. [English summary.]

In fungicide evaluation trials at the Institute for Plant Protection, Beograd, Yugoslavia, 0·15, 0·1, and 0·8 per cent. duphar [*R.A.M.*, 31, p. 334] was compared with Bordeaux mixture (1 and 0·5 per cent.) for the control of apple scab (*Venturia inaequalis*) [34, p. 705]. In the laboratory 0·15 per cent. duphar was as effective as 1 per cent. Bordeaux in preventing the germination of the ascospores, but it was slightly inferior in the field in 1951 where its protective value was of shorter duration.

Angell (H. R.). **Brown rot of stone fruits. II. Differences in incidence in the Peach variety, Levis Cling, on different soil types.**—*J. Aust. Inst. agric. Sci.*, 21, 1, pp. 30–31, 1955.

In further work on brown rot of stone fruits [*Sclerotinia fructicola*: *R.A.M.*, 31, p. 612 and above, p. 352] at Canberra in 1954, surveys were made in two peach orchards in the Shepparton district, where 5 in. of rain fell during the first few days of the harvesting period of Levis Cling, and one near Cobram, where 7 in. fell.

In the first orchard the mean number of rotted fruits within 7 ft. of the ground on 35 trees on Orrvale loam was $2{\cdot}6 \pm 1{\cdot}5$, and on 34 trees on East Shepparton sandy loam 70 ± 26. In the second, in which five soil types were represented, the loss was under 5 per cent. on Orrvale and Shepparton loams, under 10 per cent. on Shepparton sandy loam, and over 75 per cent. on Broken sand and a grey, sandy depression. In the third, the loss on sandy loam was more than half the potential crop, though on sandy loam not easily permeable to water it was only 1 per cent.

It is concluded that the main environmental factor affecting the outbreak was the excess soil moisture associated with different soil types during and after wet weather.

Ogawa (J. M.) & Charles (F. M.). **Powdery mildew on Peach trees.**—*Calif. Agric.*, 10, 1, pp. 7, 16, 2 figs., 1956.

Powdery mildew (*Sphaerotheca pannosa* var. *persicae*) of peach affects non-

glandular varieties, such as Peak and Paloro in California [*R.A.M.*, 33, p. 305], more seriously than glandular varieties such as Walton, Johnson, Halford, and Stuart. Young rather than mature leaves are attacked and infected shoots carry the fungus over the winter. Immature fruit is highly susceptible, developing roughened lesions.

Spraying experiments were carried out with lime-sulphur, alone and together with wettable sulphur, with actidione [31, p. 248], which was phytotoxic, and with karathane WD, which though the most effective, increasing marketable fruit from 31 per cent. in the controls to 53, is slightly phytotoxic to the foliage, and still in experimental usage only.

Three sprays were applied, the first at petal-fall, the second shortly before calyx-drop, both at 5 gals. per tree, and the third when fruits were about 1 in. long, at 7 gals. per tree. The sulphur spray formulations were in one case 1 gal. liquid lime-sulphur plus 4 oz. du Pont spreader-sticker per 100 gals. for each application, in the other ¾ gal. liquid lime-sulphur plus 5 lb. flotox wettable sulphur for the first and 5 lb. wettable sulphur alone subsequently. In the first case 48 per cent. marketable fruits were obtained, and in the second 50.

Mallinjoud (H.-M.). **Considérations sur l'état sanitaire du Pêcher en Savoie.** [Considerations on the state of health of the Peach tree in Savoy.] —*Rev. hort., Paris*, 128, 2209, pp. 1382–1385, 2 figs., 1955.

In Savoy, France, the leafy shoots and flowering branches of peach trees are frequently attacked by brown rot [*Sclerotinia fructigena* and *S. laxa*: *R.A.M.*, 34, p. 793], especially during a cold spring when dew is abundant and persists for more than 12 hours. Fruit rot occurs in hot, stormy summers, and may be severe. Locally, good control of infection on the branches has been obtained with pre-blossom applications of Bordeaux mixture with casein. Control of fruit rot has not been satisfactory, and it is suggested that captan [35, p. 107] should be tried again, the dosage being increased to 0·4 or 0·5 per cent. Ortho-oxyquinoline sulphate is also recommended, provided the amount of active material present is greatly increased; it should be used with a special wetter.

Against leaf curl [*Taphrina deformans*: loc. cit], which is of frequent occurrence, especially after cold, damp periods, basic Bordeaux mixture plus casein has given the best results. Shot hole [*Clasterosporium carpophilum*: loc. cit.] is very important in some years. During a very wet autumn it is essential to apply basic Bordeaux plus casein after every period of heavy rain. In recent years mildew [*Sphaerotheca pannosa* var. *persicae*] has become much more prevalent. In all the affected orchards examined infection had begun on the fruits. Fungi causing root rots [35, p. 109] are commonly present, and frequently cause wilting of the 'apoplectic' type. Silver leaf disease, probably caused by a fungus [*Stereum purpureum*: 13, p. 385], is rather common.

Carter (M. V.). **Apricot gummosis—a new development.**—*J. Dep. Agric. S. Aust.*, 59, 5, pp. 178–184, 13 figs., 1 map, 1955.

Exhaustive studies on apricot gummosis in South Australia made since 1953 at the Waite Institute have established conclusively that the condition [see above, p. 356] is caused by a species of *Eutypa*, the spores of which are air-borne over large areas. Five or six years after the trees are killed the limbs develop blackened stromata pitted with perithecia from which, following 15 to 30 minutes' rainfall, the ascospores are ejected and carried to new areas where they infect pruning wounds on healthy apricot trees. Once discharged the spores can survive up to two weeks in hot, dry weather and up to five or six weeks in autumn or spring. In inoculation experiments in May, 1955, spores taken directly from a dead limb in the Barossa Valley infected healthy apricot seedlings in the

greenhouse. The known distribution of actively infectious material is indicated by a map.

Control lies solely in destroying sources of infection, such as badly neglected apricot trees, infected dead limbs, and stumps, combined with the use of proper pruning methods [34, p. 795].

Morschel (J. R. G.). **Shot hole of Apricots on Murrumbidgee irrigation areas.**—*Agric. Gaz. N.S.W.*, 66, 10, pp. 545–547, 551, 2 figs., 1955.

Investigations of apricot shot hole disease (*Clasterosporium carpophilum*) in New South Wales [*R.A.M.*, 32, p. 681 and above, p. 356] showed that two types of lesion occur on the fruits. One ranges from pepper-like spots to others 0·5 mm. in diameter, which are mainly on the exposed side of the fruit and slough off as this develops, having gone by harvest time. Their cause is unknown. The other is due to *C. carpophilum*; by harvest time this develops into a raised scab or sunken lesion.

In order to control shot hole three spray applications are recommended as follows: at leaf fall, Bordeaux mixture 10–10–100 or zinc Bordeaux 10–5–10–100, both with ½ gal. white oil; or alternatively, copper oxychloride 5 lb. per 100 gals., or 80 per cent. thiram 1·5 lb. per 100 gals.; the same at early blossoming, and thiram at 'shuck fall' [calyx-drop]. If sources of infection can be sufficiently reduced, the leaf-fall spray may be unnecessary.

Hobart (O. F.), Fink (H. C.), & Buchholtz (W. F.). **Virus spread in nursery blocks of sour Cherries in southwest Iowa.**—*Iowa St. Coll. J. Sci.*, 30, 2, pp. 249–253, 1955.

Observations from 1949 to 1952 on the spread of cherry yellows virus and necrotic ring spot virus [*R.A.M.*, 34, p. 654 and next abstract] in sour cherry nursery blocks of south-west Iowa, indexing on *Prunus tomentosa* [loc. cit.], showed that there was spread of virus in the blocks, the presence of an above-ground vector appearing probable.

Hobart (O. F.) & Buchholtz (W. F.). **Detection of Cherry virus in Prunus mahaleb.**—*Iowa St. Coll. J. Sci.*, 30, 2, pp. 277–285, 1 fig., 1955.

To produce sour cherry trees free from virus it is necessary to ensure that the *Prunus mahaleb* stock used is itself free from virus. *P. tomentosa* was used for indexing at the Iowa Agricultural Experiment Station [*R.A.M.*, 35, p. 26 and preceding abstract], expressing symptoms satisfactorily at greenhouse temperatures of 60°, 70° and 80° F. The symptom expression of *P. mahaleb* itself was unreliable.

De Fluiter (H. J.). **Discussiedag over ziekten en gezondheidsselectie bij Aardbeien.** [Discussion day on diseases and selection for health in Strawberries.]—*Meded. Dir. Tuinb.*, 18, 7, pp. 444–479, 6 figs., 1955. [English summary.]

H. J. De Fluiter's contribution (pp. 449–458) to the above-mentioned discussion at Wageningen, Holland, on 4th April, 1955, was concerned with strawberry viroses [see above, p. 375 and next abstract] and methods for the production and maintenance of virus-free stocks.

L. M. Wassenaar (pp. 463–468) described the existing position in regard to June yellows [*R.A.M.*, 34, p. 655], the hereditary nature of which has been demonstrated by the results of hybridization between susceptible varieties, e.g., Blakemore, Madame Moutot, Howard 17, Climax, and Perle de Prague. The progeny of such crosses invariably comprises a certain percentage of variegated plants, while a tendency to the mutation persists even in the remote descendants (up to 11 years in Climax).

M. Bok (pp. 475–478) gave some practical information on the performance of selected planting material of Deutsch Evern, Climax, and Jucunda, and of the factors influencing their productivity.

Schöniger (G.) & Bauer (R.). **Erdbeervirosen in Deutschland. I. Befund nach Pfropfung verschiedener Sorten auf Fragaria vesca L.** [Strawberry viroses in Germany. I. Findings after the grafting of different varieties on *Fragaria vesca* L.]—*Phytopath. Z.*, 24, 4, pp. 443–454, 1 fig., 1955.

Following an introductory survey of the present status of strawberry viroses [see preceding abstract] in the United States and Great Britain, the authors describe and tabulate the results of grafting experiments at the Max Planck Institute for Plant Breeding, Köln-Vogelsang, Germany, on an East Malling clone of *Fragaria vesca* [cf. above, p. 375], using 68 varieties, lines, and selections, the results on 52 of which may be regarded as final. Of this number 39 (75 per cent.) were found to harbour latent viruses (in some cases very pernicious ones), which fell into six groups on the basis of the reactions induced in the indicator plants. Some of the symptoms were in close agreement with those reported from the United States [*R.A.M.*, 31, p. 288] and Canada [31, p. 449], the analogies with English viroses [32, p. 573] being less clearly defined.

Hill (R. G.). **The correction of chlorosis in Blueberries with chelated iron compounds.**—*Down to Earth*, 11, 2, pp. 6–7, 2 figs., 1955.

Blueberries [*Vaccinium* spp.] on upland soils in Ohio are often chlorotic [cf. *R.A.M.*, 34, p. 605], a condition which does not usually respond to soil or leaf applications of iron compounds. At the Ohio Agricultural Experiment Station, Wooster, it was found that a soil application of 100 gm. per plant of an iron chelate, well worked in, restored the leaves to normal green within 30 days, and subsequently improved the yield in comparison with untreated plants.

Tandon (R. N.), Sisodia (U. S.), & Bilgrami (K. S.). **Pathological studies of Pestalotia mangiferae.**—*Proc. Indian Acad. Sci.*, Sect. B, 42, 5, pp. 219–225, 1 pl., 1955.

Although *Pestalotia mangiferae* has been associated with a disease of mango in the past [*R.A.M.*, 5, p. 584; 12, p. 77; 34, p. 659], its pathogenicity has not been established. The authors, working in the Department of Botany, University of Allahabad, observed it on mango leaves, causing light brown spots, changing to olive grey, with the black spots of the pseudopycnidia within the affected area, the infected portion of the leaf finally falling away. Affected fruits become rotted, the infected area changing from snuff brown to olivaceous black and subsequently shrinking. Inoculation experiments showed the fungus to be a weak parasite, capable of infecting injured leaves and fruits, and healthy fruits if in contact with diseased.

Raabe (R. D.) & Zentmyer (G. A.). **Susceptibility of Avocados to Dematophora root rot.**—*Plant Dis. Reptr*, 39, 6, pp. 509–510, 2 figs., 1955. [Multilithed.]

This information on the extreme susceptibility of avocado rootstocks to *Rosellinia necatrix* in California has already been noticed from another source [*R.A.M.*, 35, p. 307].

Results of 1954 fungicide tests.—*Agric. Chemic.*, 10, 4, pp. 47–51; 5, pp. 39–42, 113; 6, pp. 53–59, 125, 127, 1955.

Reports received by the special committee on the testing of newer fungicides set up by the American Phytopathological Society [cf. *R.A.M.*, 34, p. 736] in 1954 are summarized. On apples sulphur sprays, captan, glyodin [34, p. 164], phygon XL, and ferbam controlled scab [*Venturia inaequalis*: 34, p. 40] and cedar-apple rusts [*Gymnosporangium juniperae-virginianae* and *G.* sp.: 30, p. 52] in the United States and Canada. Powdery mildew [*Podosphaera leucotricha*: 33, p. 303] was controlled by wettable sulphur (3 lb. per 100 gals.) in New York and karathane

(1 lb.) in Delaware. Bordeaux mixture (2–4–100) and captan in four bi-monthly applications, were effective against blotch [*Phyllosticta solitaria*: 33, p. 431] in Oklahoma, while summer sprays of ferbam or captan plus zineb controlled [sooty] blotch [*Gloeodes pomigena*: loc. cit.] in New York and Delaware. In combined tests against scab, sooty blotch, and *Botryosphaeria ribis* [32, p. 568] on Rome apples in Delaware the incidence on untreated trees was 50, 27, and 37 per cent., respectively; on those sprayed at pink—first cover with tag (0·25 lb. to 100 gals.) plus captan (1 lb.) incidence was reduced to 1, 8, and 6 per cent. Comparable results were obtained with mixtures of captan and zineb.

Against fireblight [*Erwinia amylovora*] on pear [35, p. 25] the following were found effective in Washington: agrimycin (120 p.p.m.), streptomycin sulphate (120 p.p.m.), Bordeaux mixture ($\frac{1}{2}$–$\frac{1}{2}$–100), and COCS (0·5 lb. to 100 gals.); the last two slightly russetted the fruit.

Peach scab [*Fusicladium carpophilum*: 35, p. 25] was controlled by customary sprays or dusts of sulphur, ziram, or captan in New York, and by wettable sulphur and captan in South Carolina [loc. cit.] and Tennessee. In South Carolina the two last-named equally controlled brown rot of peaches [*Sclerotinia fructicola*: 35, p. 27], but only captan controlled *Rhizopus* [*stolonifer*] storage rot. In New York peach leaf curl [*Taphrina deformans*: 31, p. 497] was controlled by ferbam (1·5 lb. per 100 gals.), lime-sulphur (6·5 gals.), dinitro compound materials (0·5 gal. or 2 lb. dry wettable), and Bordeaux mixture (10–10–100), and by zerlate (3 lb.) in California.

Monilia [*roreri*] pod rot of cacao in Ecuador [see p. 359] sprayed at 7 to 10 days intervals throughout the year, was controlled by all chemicals tested, but yellow cuprocide (1 lb. to 100 gals.), wettable sulphur (10 lb.), and zineb (2 lb.) gave the best results in the order named. Sulphur-sprayed trees gave 2·9 times and all others 1·9 times the yields of 1953, except those sprayed with yellow cuprocide, which failed to increase yields, possibly through being phytotoxic.

Walnut bacteriosis [*Xanthomonas juglandis*: 35, p. 114] in Oregon was controlled by both yellow cuprocide and copper A compound (2 lb. per 100 gals.) and also by agrimycin (100 p.p.m. streptomycin and 100 p.p.m. terramycin). Agrimycin was least phytotoxic and gave better control than copper A; yellow cuprocide gave the best control, but was the most phytotoxic.

Four applications of captan, ziram, or maneb [34, p. 470] (2 lb. per 100 gals.) controlled *Coryneum* blight [*Clasterosporium carpophilum*] on almond in California.

Anthracnose [*Elsinoe veneta*: 31, p. 499] of red raspberries in western Washington was controlled by two sprays in June. Phygon XL (0·5 lb. to 100 gals.), captan (2 lb.), dithane M-22 (1·5 lb., containing maneb), and fermate (1·5 lb.), the last being also recommended for use on black raspberries in Michigan, were effective in the order given. Dithane M-22 (2 lb.), captan (2 lb.), and fermate (1·5 lb.) controlled blackberry leaf spot [*Mycosphaerella rubi*: 29, p. 571] in Alabama with three to five applications. Dithane gave the best control and highest yields, while fermate was the most economical.

Captan at 5 per cent. and next to it crag 5400 (6 per cent.) reduced grey mould rot (*Botrytis* [*cinerea*: 34, p. 625]) on grapes in California in four monthly dustings. In Louisiana the percentage of strawberries rotted by *Botrytis* [cf. 33, p. 541] in storage was reduced to 5 per cent. by good-rite SDD (sodium dimethyldithiocarbamate, 1 to 100), to 7 by calogreen (1 to 1,000), and to nil by C.&C.EF 224 [mercury zinc chromate] (1 to 500), compared with 85 for berries dipped in a spore suspension and 25 for undipped.

Brown patch [*Corticium solani*] caused 41 and 11·2 per cent. infection in untreated plots of Astoria and Rhode Island colonial bent grasses [*Agrostis tenuis*: 31, p. 330; 33, p. 30] in Rhode Island. Calocure (2 oz. to 1,000 sq. ft., seven applications at 14-day intervals) reduced infection to 3 per cent. on both grasses, and at 1 oz.

plus 1 oz. tersan 75, to 2 per cent. on Astoria, while on Rhode Island it was reduced by calo-chlor (2 oz., three weekly applications) to 1·6, by nugreen (53·3 oz., two at one month) to 0·8, and by tersan 75 (33·7 oz., two at one month) to 1·4 per cent. On Seaside and Washington bent turfs [*A. palustris*] affected by dollar spot (*Sclerotinia* [*homoeocarpa*: 32, p. 131]) in Michigan, there were between 30 and 40 spots per sq. ft. in September, but three applications of calo-chlor (4 oz.) or cadminate (0·4 oz.) eliminated it completely. Copper spot [*Gloeocercospora sorghi*] on Seaside creeping bent in New Jersey, rated by the average number of spots per plot, was reduced from 281 on the untreated to 9 by seven applications at 10-day intervals of PMAS (1 fl. oz. to 1,000 sq. ft.), to 5 by puraturf (0·1 pint), and to 7 by puraturf 177 (0·6 oz.) and cadminate (0·5 oz.). The corresponding figures for dollar spot were: untreated 15·6, krominate (a cadmium complex, at 0·5 oz.) nil, and vancide 51 (0·5 pint) 0·5. In Georgia dollar spot on rye grass [*Lolium* sp.] was controlled by calocure (2 oz.) and cadminate ($\frac{1}{2}$ oz.) at 14-day intervals.

Snow mould on golf courses is caused by *Fusarium nivale* [*Calonectria nivalis*] at Pullman, Washington, and *Typhula itoana* at Spokane; one application of fungicide in late autumn controlled *C. nivalis*, 48 per cent. disease being present in the check plots, 1·7 following PMA solubilized No. 10 and tat-c-lect (phenylmercury acetate), 3·8 with cadminate, all at 2 oz. to 1,000 sq. ft., and 2 with puraturf (3 oz.). *T. itoana* was reduced from 26·7 to nil by PMA solubilized No. 10, PMAS (each at 0·2 pints), and cadminate (2 oz.).

Damping-off of soybeans in Ontario was adequately controlled by seed treatments with orthocide 75 (captan, 2·5 oz. per 100 lb. seed) and vancide 51 (8 fl. oz.). *Colletotrichum* [*Glomerella*] *gossypii* was eliminated from re-ginned cotton seed in South Carolina by B 856 dust (0·15 per cent. active [ingredient unspecified]) but it was less effective as a slurry or on fuzzy seed. Damping-off and sore shin (*Rhizoctonia* [*Corticium*] *solani*) were controlled by soil treatments with PCNB (pentachloronitrobenzene) at 5 lb. per acre in South Carolina and California, and in the latter State with PCNB plus captan (5 and 2·5 lb.). Both dithane Z-78 and parzate dusts (15 to 35 lb. per acre), applied in Florida three times a week, controlled tobacco blue mould [*Peronospora tabacina*: 34, p. 405]. Tobacco wildfire [*Pseudomonas tabacum*: 34, p. 754] in Pennsylvania was controlled by agrimycin (100 to 200 p.p.m.) applied in three to five weekly sprays on seed-beds, beginning when the first leaves had attained a diameter of approximately $\frac{3}{4}$ in.

Bacterial scab [*Pseudomonas marginata*] of gladiolus [34, p. 787] was controlled in Washington by dipping corms in a mixture of tersan (1 in 75) and heptachlor (1 in 417); tersan alone or with agrimycin up to 1,000 p.p.m. was inadequate. Corm dips of emmi 10 per cent. emulsifiable (a reaction product of potassium dichromate, copper sulphate, and arsenic pentoxide) [35, p. 17] concentrate, Du Pont liquid seed disinfectant, or new improved ceresan controlled *Fusarium* rot [*F. oxysporum* f. *gladioli*] in Illinois.

Botrytis [*cinerea*] petal spot and rust [*Coleosporium solidaginis*] of China aster in New York were both controlled by tank-mix zineb (nabam plus zinc sulphate). Four or more applications of dithane Z-78 (0·75, 0·5, and 0·375 lb. in 100 gals.) weekly from July 8th gave 19 per cent. control of petal spot following artificial inoculation and 100 per cent. control of rust, the corresponding figures for liquid parzate (3, 2, 1·5 pints) being 76 and 100, and for bloomocide (2, 1·5, 1) 25 and 99.

Black spot of rose [*Diplocarpon rosae*; 33, p. 28] was effectively controlled in New York and Texas by sprays or dusts containing maneb, captan, ferbam, glyodin [34, p. 164], dichlone [loc. cit.], or copper dihydrazinium sulphate. Maneb and zineb (1 lb. to 100 gals.) gave the most effective control (95 and 80 per cent., respectively) of *Alternaria dianthi* on carnations and of rust (*Puccinia antirrhini*) on snapdragon [antirrhinum] (66 and 65 per cent.) following artificial inoculation. The control percentages for karathane (0·5 lb.) were 80 and 79 for the two diseases.

In vegetable seed treatments orthocide 75 plus dieldrin gave an emergence of 63·9 per cent. of Round Pod Kidney wax bean [*Phaseolus vulgaris*] in Michigan, semesan gave 59·9 for beans and 61·1 for Alderman peas, and ethyl B-856 69·6 for peas, compared with 20·8 (beans) and 39 (peas), untreated. Seventy five per cent. thiram or captan, and also semesan have proved effective as seed treatments for damping-off of most vegetable seedlings in New York. Dichlone was effective on beet, carrot, spinach, and maize, and chloranil [32, p. 28] on peas and radish.

The onion smut fungus [*Urocystis cepulae*: 33, p. 462] was effectively controlled by pelleting onion seed with tersan 75 (5·3 and 10·6 oz. per lb.) or orthocide 75 (10·6 oz. per lb.) in infested soil in Minnesota, resulting in yield increases of 8·08, 9·41, and 7·28 tons per acre, respectively.

In Ohio powdery mildew of cucumber [*Erysiphe cichoracearum*: 34, p. 571] was controlled by maneb, organic copper, or karathane sprays, while karathane dusts and ovotran were effective in California, but sulphur dusts with more than 50 per cent. sulphur were phytotoxic. Crag 658 gave good control of bacterial wilt of cucurbits [*Erwinia tracheiphila*] but increased the amount of mildew. Tribasic copper sulphate (3 lb. to 100 gals.) plus dithane Z-78 (2 lb.), or alternating at 4 lb. and 2 lb., gave the best control of powdery mildew in Maryland. In South Carolina maneb or zineb sprays or dusts were effective in controlling cucumber anthracnose [*Colletotrichum lagenarium*] and downy mildew [*Pseudoperonospora cubensis*].

PCNB (12·5 lb. per acre) sprayed at planting time controlled garlic white rot [*Sclerotium cepivorum*].

On Long Island 6 per cent. of the pods of untreated lima beans [*Phaseolus lunatus*] were infected by downy mildew [*Phytophthora phaseoli*: 34, p. 124], following artificial inoculation; weekly sprays from 1st July (125 to 150 gals. per acre) of tribasic copper sulphate (4 lb. to 100 gals.), manzate (2 lb.), and a mixture containing 48 per cent. copper and 4 per cent. manganese (4 lb.) kept infection down to 0·1, 0·1, and 0·4 per cent., respectively.

In Ohio maneb, tennam 10 (an organic manganese compound), L0-738, SDD plus zineb, or SDD plus zinc sulphate sprays gave the best control of potato early blight [*Alternaria solani*: 34, p. 470]; in a severe outbreak in one experiment zineb gave good control regardless of concentration and pressure. Organic protectants for the third successive year did not impair potato chipping quality.

Southern blight of tomatoes [*Sclerotium rolfsii*: 34, p. 554] was controlled by a pre-planting application of PCNB (10 lb. per acre, 1 gal. suspension per 100 ft.). Anthracnose [*Colletotrichum atramentarium*] and early blight were controlled by maneb in Illinois, Ohio, and Maryland; in Maryland alternate applications of ziram and fixed copper also controlled anthracnose. Tomato late blight [*Phytophthora infestans*] in Florida was effectively controlled by zineb, maneb, L0-738, and nabam plus either zinc sulphate or manganous sulphate, 17 applications at five-day intervals.

Koch (H.). **Geometrische Figuren und ihre Anwendbarkeit auf Düsen-Flüssigkeitsstrahlen bei mehrdüsigen Pflanzenschutzgeräten zwecks Wahl des richtigen Düsenabstandes zur Erzielung bestmöglicher Flüssigkeitsverteilung.** [Geometrical figures and their applicability to nozzle fluid jets in multi-nozzle plant protection apparatus for the purpose of selecting the correct nozzle spacing to ensure the best possible distribution of fluid.]—*Mitt. biol. ZentAnst. Berl.* 82, 38 pp., 6 figs., 2 diags., 27 graphs, 1954.

At the Institute for the Testing of Apparatus of the Biological Institute, Brunswick, Germany, the author studied the flow of liquid from outlets of various shapes, both extensible and fixed, in order to determine which shapes and what relative spacing would give optimum distribution of the fluid. The solid figures formed by

the jets were converted to linear 'volume' graphs by dividing the figures into a series of disks or strips; they could thus be compared and the spreading effects determined. It was found that plane jets through triangular or trapezoid orifices could be substituted sufficiently accurately by cylindrical jets from solid or hollow cones. For the latter a diagram is given from which it is possible to read off the correct spacing of the nozzle openings provided the inner and outer diameters of the hollow jet are known. A method is given for the approximate estimation of these values from a commercial sprayer.

WALKER (ALMA T.). **Germination and respiration responses of Myrothecium verrucaria to organic fungicides.**—*Iowa St. Coll. J. Sci.*, 30, 2, pp. 229–241, 1955.

In studies at the Iowa Agricultural Experiment Station the effect of nine organic fungicides on *Myrothecium verrucaria* was measured by comparison of the LD50 values, slopes of dosage-response curves, and the effect of the duration of treatment on germination and spore and mycelial respiration [cf. *R.A.M.*, 34, p. 383]. The fungicides used were ethyl mercury chloride, actidione, pentachlorophenol, thiram, *p*-benzoquinone, nabam, 2-4-dinitrophenol, dichlone, and chloranil. Germination LD50 values for the first seven of these ranged from about 2 to 90 p.p.m., in the order given. Except for actidione, the LD50 values for spore respiration were all higher, but in the same order. Mycelial respiration was generally less sensitive than spore respiration. Changes in inhibition of spore respiration in relation to length of time of exposure, and variation in the degree of maximum inhibition, indicated possible differences in the mechanism of action of the toxicants. No difference was observed in the sensitivity of carbon dioxide evolution and oxygen consumption of the spores with the different treatments.

YAST (J. F.), FREDERICK (J. B.), & MIGRDICHIAN (V.). **Malathion and its formulations. Parts I & II.**—*Agric. Chemic.*, 10, 9, pp. 43–45, 137, 139; 10, pp. 42–44, 105, 107, 1955.

In part II of this account of the pesticide malathion (S-(1, 2-dicarbethoxyethyl) 0, 0-dimethyl dithiophosphate) details are given in tabular form regarding its compatibility with a large number of fungicides over increasing periods of time, up to two years.

RIPPEL-BALDES (A.). **Grundriß der Mikrobiologie. Dritte Auflage.** [Outline of microbiology. Third edition.]—v—418 pp., 130 figs., 3 diags., 27 graphs, Berlin, Springer-Verlag, 1955. DM. 45.

Important new developments in the microbiological field have been incorporated in this latest edition of the author's treatise [cf. *R.A.M.*, 31, p. 251], and more attention has been paid to algae and protozoa. Otherwise the general plan of the work remains unaltered.

KUĆ (J.), ULLSTRUP (A. J.), & QUACKENBUSH (F. W.). **Production of fungistatic substances by plant tissue after inoculation.**—*Science*, 122, 3181, pp. 1186–1187, 1 fig., 1955.

In studies at Purdue University, Lafayette, Indiana, substances inhibitory to the growth of *Helminthosporium carbonum*, *Cerastotomella ulmi*, and *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* were found in potato peel. The three fungi made little or no growth on a medium containing extract of peel or of pulp tissue inoculated with any one of these fungi. The peel appeared to contain a high concentration of inhibitory material. The response of carrot and turnip tissue resembled that of potato tuber tissue. The evidence also showed that if the peel tissue is injured or removed, the adjacent pulp tissue is able to produce inhibitory substances immediately round the points of penetration.

CAMMACK (R. H.). **Seasonal changes in three common constituents of the air spora of southern Nigeria.**—*Nature, Lond.*, 176, 4496, pp. 1270–1272, 3 graphs, 1955.

Fluctuations in the spore populations of *Puccinia polysora*, *Nigrospora sphaerica*, and *Cladosporium* spp. in the air, all of which are normally present throughout the year, were studied at the Federal Department of Agricultural Research, Ibadan, Nigeria, by means of an automatic volumetric spore trap having an orifice 2 m. above ground level in a field of closely mown grass. Hirst's method [*R.A.M.*, 33, p. 615] was adapted to the prevailing high temperature and humidity by using 'solvar 3515' as the priming film on the slide and B.D.H. paraffinum molle album plus 1½ per cent. ceresin wax as an adhesive instead of vaseline. Slides were exposed for 24-hour periods, counts being expressed as numbers of spores per cu. m. of air and diurnal periodicities being obtained from counts made over the rainy period from April to June, 1954, and the dry period from December, 1954, to March, 1955.

The wet and dry season curves were similar in form, but peak concentrations occurred earlier in the day during the dry season. The highest concentrations of all three species occurred under conditions of high temperature and low humidity. The wet season curves of *P. polysora* and *Cladosporium* spp. agreed generally in form with those obtained in Britain for the uredospore group and *Cladosporium* spp., respectively [loc. cit.]. The concentration of *P. polysora* was much higher in the wet season than in the dry, while that of *Cladosporium* was high in both seasons and *N. sphaerica* higher in the dry. The variations in spore numbers depend largely on the availability of hosts during each season, as well as on climatic factors.

MILLER (P. R.) & O'BRIEN (MURIEL). **The role of the Plant Disease Survey in forecasting plant diseases.**—*Indian Phytopath.*, 7 (*1954*), 2, pp. 91–102, 2 diags., 1955.

The authors trace the history of the Plant Disease Survey of the United States Department of Agriculture since its inception nearly 40 years ago up to the present current system of warning services for forecasting outbreaks of plant diseases [*R.A.M.*, 32, pp. 29, 615], together with the associated research. The work has greatly advanced knowledge of the environmental requirements and life-histories of certain fungi and formed a basis for the experimental regional forecasts which have attained great accuracy. The name has now been changed to Plant Disease Epidemics.

OWEN (J. H.). **Weather as related to plant disease development in the Gainesville area of Florida from January to April, 1955.**—*Plant Dis. Reptr*, 39, 6, pp. 467–469, 1 graph, 1955.

The weather conditions prevailing in the Gainesville area, Florida, during the first three months of 1955 were unfavourable to the development of plant diseases. Azalea [*Rhododendron*] flower spot (*Ovulinia azaleae*) [*R.A.M.*, 35, p. 190], which had occurred regularly every season since 1940, was practically non-existent owing to unfavourable temperatures and lack of rain while the flowers were most vulnerable. Blight (*Phytophthora infestans*) was unusually mild on potatoes [34, p. 581] and tomatoes [33, p. 752] owing to the high temperatures and insufficient moisture. The same factors prevented the development of citrus scab (*Elsinoe fawcetti*) [C.M.I. map No. 125] on new growth in the Gainesville area and in unsprayed groves in Marion county. Dogwood [*Cornus* sp.] spot anthracnose (*E. corni*) [*R.A.M.*, 32, p. 255; 35, p. 185] and oak leaf blister (*Taphrina caerulescens*) [33, p. 509], both abundant in the previous year, were not observed. Some infection of tobacco with downy mildew (*Peronospora tabacina*) [35, p. 48] was noted, and rainfall and low temperatures from 24th March to 7th April favoured the development of the disease during the latter part of the season.

SANFORD (G. B.) & SKOROPAD (W. P.). **Distribution of nuclei in hyphal cells of Rhizoctonia solani.**—*Canad. J. Microbiol.*, 1, 6, pp. 412–415, 1 pl., 1955.

In a microscope study of 568 cells of stained mycelium of *Rhizoctonia* [*Corticium*]

solani [*R.A.M.*, 33, p. 722] at the University of Alberta three kinds were differentiated on the basis of the number of nuclei: in hyphal tip cells there were from two to 15, the majority having between four and eight; in 'Y' type cells four to 25 (majority four to 15); and in unbranched cells three to 19 (majority six to 11). Nuclear migration through septa, in the direction of growth, was observed *in vivo*, and is considered to be one of the contributory factors to the variability of *C. solani*.

Bellinger (H.). **Kerndarstellungen bei Schimmelpilzen mittels verschiedener Färbungen und Versuche zur Polyploidisierung mit Colchicin.** [Demonstrations of nuclei in moulds by means of various stains and attempts at polyploidization with colchicine.]—*Zbl. Bakt.*, Abt. 2, 109, 1–4, pp. 13–16, 1956.

In cytological studies on *Rhizopus nigricans* [*R. stolonifer*], *Cladosporium* sp., *Trichothecium roseum*, *Trichoderma viride*, *Aspergillus glaucus*, and *Penicillium* sp. the nuclei were clearly demonstrated by the Feulgen and Giemsa stains but not by haemalum-eosin or carmine-acetic acid. Colchicine exerted no influence on the process of nuclear division.

Morgan (B. S.) & Goodman (R. N.). **In vitro sensitivity of plant bacterial pathogens to antibiotics and antibacterial substances.**—*Plant Dis. Reptr*, 39, 6, pp. 487–490, 1955. [Multilithed.]

The sensitivity of 14 phytopathogenic bacteria to eight antibiotics, two synthetic antibacterial substances, and an antibiotic combination (agrimycin-100) was tested *in vitro* by the tube dilution method at the Department of Horticulture, University of Missouri. The antibiotics varied considerably in their capacity to inhibit the entire spectrum of test organisms and none was consistently superior to the others. Aureomycin was the most effective against a majority of the pathogens, followed by neomycin, then streptomycin [*R.A.M.*, 35, p. 114], terramycin, polymyxin, and streptothricin. Of the bacteria tested *Pseudomonas solanacearum*, *P. pisi*, and *Erwinia carotovora* were the most resistant. The last two were both inhibited by aureomycin and terramycin at 1·6 and 6·3 μgm. per ml., respectively, and by neomycin and polymyxin at less than 1 μgm., whereas *P. solanacearum* was effectively inhibited by lower concentrations of aureomycin and terramycin and relatively insensitive to the other two antibiotics. Agrimycin-100 was superior to streptomycin against seven organisms, equal against six, and slightly inferior against *Corynebacterium michiganense*; compared with terramycin it was superior against 11, equal against two, and inferior against *Agrobacterium tumefaciens*.

Tirunarayanan (M.) & Sirsi (M.). **Oxysporin, a new antibiotic from Fusarium oxysporum Schlecht.**—*Curr. Sci.*, 24, 5, p. 162, 1955.

Seven of the 16 strains of *Fusarium oxysporum* tested for antibiotic production at the Pharmacology Laboratories, Indian Institute of Science, Bangalore, were active, strain 549, obtained from the Ministry of Agriculture, Argentina, being the most productive. The anti-bacterial substance produced is unlike any of those previously isolated from *F. oxysporum* [*R.A.M.*, 27, p. 488] and is named oxysporin.

Brian (P. W.), Curtis (P. J.), & Hemming (H. G.). **Production of griseofulvin by Penicillium raistrickii.**—*Trans. Brit. mycol. Soc.*, 38, 4, pp. 305–308, 1955.

At the Imperial Chemical Industries, Ltd., Butterwick Research Laboratories, Welwyn, Herts, griseofulvin [*R.A.M.*, 34, p. 802], hitherto known as a metabolic product of *Penicillium griseofulvum* (*Biochem. J.*, 33, pp. 240–248, 1939), *P. nigricans* [*R.A.M.*, 33, p. 369], and *P. urticae*, was found to be produced by some strains of *P. raistrickii* [13, p. 188]. In culture the strains producing abundant conidia have few sclerotia and produce good yields of griseofulvin, the reverse being true of sclerotial strains.

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